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Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-29367*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EFFECT OF SPANWISE BLOWING ON LEADING-EDGE VORTEX BURSTING OF A HIGHLY SWEPT ASPECT RATIO 1.18 DELTA WING

Wayne L. Scantling and Blair B. Gloss 15 Jul. 1974 30 p refs

(NASA-TM-X-71987) Avail: NTIS HC $3.25 CSCL 01A

An investigation was conducted in the Langley 1/8-scale V/STOL model tunnel on a semispan delta wing with a leading-edge sweep of 74 deg, to determine the effectiveness of various locations of upper surface and reflection plane blowing on leading-edge vortex bursting. Constant area nozzles were located on the wing upper surface along a ray swept 79 deg, which was beneath the leading-edge vortex core. The bursting and reformation of the leading-edge vortex was viewed by injecting helium into the vortex core, and employing a schlieren system. Author

N74-29368# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.

THREE COMPUTER PROGRAMMES TO CALCULATE THE STEADY OR UNSTEADY SUBSONIC CHARACTERISTICS OF LIFTING SURFACES IN GROUND EFFECT

G. H. S. Pike Jan. 1974 78 p refs

(ATN-7401) Avail: NTIS HC $7.00

Computer programs to calculate the subsonic, unsteady, and steady aerodynamic properties of lifting surfaces are presented. The programs are written in FORTRAN in two cases and BASIC in one case. The thin wing kernel function approach is used. Evidence is presented of the extreme sensitivity of the method to the size of the strip isolating the singularity. Banked and nonplanar wings, ground effect, and symmetrical, asymmetrical, and antisymmetrical loading are accounted for. A listing of the computer programs is provided. Author

N74-29369*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF A 1.15-PRESSURE-RATIO AXIAL-FLOW FAN STAGE WITH A BLADE TIP SOLIDITY OF 0.5

Walter M. Osborn and Ronald J. Steinke Washington Aug. 1974 95 p refs

(NASA-TM-X-3052; E-7433) Avail: NTIS HC $4.00 CSCL 20D

The overall and blade-element performance of a low-solidity, low-pressure-ratio, low-tip-speed fan stage is presented over the stable operating range at rotative speeds from 90 to 120 percent of design speed. At design speed a stage peak efficiency of 0.836 was obtained at a weight flow of 30.27 kilograms per second and a pressure ratio of 1.111. The pressure ratio was less than design pressure ratio, and the design energy input into the rotor was not achieved. A mismatch of the rotor and stator blade elements resulted due to the lower than design pressure ratio of the rotor. Author

N74-29370*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.

USE OF A PITOT-STATIC PROBE FOR DETERMINING WING SECTION DRAG IN FLIGHT AT MACH NUMBERS FROM 0.5 TO APPROXIMATELY 1.0

Lawrence C. Montoya, Merle A. Economu, and Ralph E. Cissell Jul. 1974 22 p refs

(NASA-TM-X-56025; H-844) Avail: NTIS HC $3.00 CSCL 01A

The use of a pitot-static probe to determine wing section drag at speeds from Mach 0.5 to approximately 1.0 was evaluated in flight. The probe unit is described and operational problems are discussed. Typical wake profiles and wing section drag coefficients are presented. The data indicate that the pitot-static probe gave reliable results up to speeds of approximately 1.0. Author

N74-29371# Bell Helicopter Co., Fort Worth, Tex.

AN ANALYSIS OF FIXED WING-PROPROTOR INTERFERENCE FOR FOLDING PROPROTOR AIRCRAFT Technical Report, 1971 - 1973

Carl G. Matthys, Mukund M. Joglekar, and P. Y. Ksieh Mar. 1973 320 p refs

(Contract F33615-70-C-1133; AF Proj. 8219)

(AD-778823; AFFDL-TR-72-115) Avail: NTIS CSCL 01/1

The report describes the development and implementation of an analysis of the mutual aerodynamic interference of the wing and the proprotor on a folding proprotor aircraft. The analysis was developed to complement and expand the capabilities of an existing AFFDL stability and control prediction method for helicopters and stoppable rotor aircraft. The wing-rotor interference section was added to the AFFDL program as an option to the user. This report is divided into four parts. The first part describes the formulation of a math model and its capabilities. The flight mode response of a typical folding proprotor aircraft during rotor feathering is discussed. The second part explains usage of a computer program implementing the math mode. Sample cases are presented as well as a description of the input and output formats. The third part contains a cross reference index of FORTRAN variables and subroutine names. The fourth part is a complete FORTRAN listing of the AFFDL program modified to include the interference subroutine. Author (GRA)

N74-29372# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Sciences.

SUPPRESSION OF FLUTTER ON INTERFERING LIFTING SURFACES BY THE USE OF ACTIVE CONTROLS Scientific Report

Emil Ernest Cwach and Ronald Oran Stearman Jan. 1974 174 p refs

(Grant AF-AFOSR-1998-71; AF Proj. 9782)
(AD-779770; AFOSR-74-0787TR) Avail: NTIS CSCL 01/1

An investigation into the possible increase in flutter speed of interfering lifting surfaces by the use of active controls was conducted. The study was designed so that the methods developed to determine the maximum increase in flutter speed could be applied to complex air vehicle configurations throughout the Mach number/altitude range of modern aircraft. The unsteady aerodynamic forces on the lifting surfaces were computed by using doublet lattice aerodynamic computer programs. The structural features of the lifting surfaces were represented by either experimentally measured or analytically computed vibration frequencies and mode shapes. The results of the study indicated that the use of active controls to suppress flutter on interfering lifting surfaces can be more effective than suppressing flutter on isolated surfaces. Author (GRA)

N74-29373# Avco Corp., Wilmington, Mass.
THEORETICAL STUDY OF DYNAMIC STALL Final Report
Peter Crimi Apr. 1974 46 p refs
(Contract DAHC04-71-C-0017)
(AD-779549; AVSD-0119-74-RR; AROD-9471-1-E) Avail: NTIS CSCL 01/3

An analysis of unsteady trailing-edge stall of a two-dimensional airfoil was carried out, the objectives being to develop tools for analysis of the general dynamic stall problem and to gain further understanding of the underlying mechanisms of the unsteady stall process. The problem was first formulated to take direct account of the interactions of the viscous and inviscid flows, but an acceptable matching of the potential-flow and viscous-flow solutions could not be obtained. A different approach was then taken, whereby the effects of the viscous flow were introduced through imposition of a boundary condition on pressure along a surface in the separated flow region. (Modified author abstract) GRA

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-29374*# Boeing Commerical Airplane Co., Renton, Wash.
BRAKE CONTROL SYSTEM MODIFICATION, AUGMENTOR WING JET STOL RESEARCH AIRPLANE (AWJSRA)
R. L. Amberg, J. A. Arline, and R. W. Jenny 24 Jun. 1974 78 p refs
(Contract NAS2-7641)
(NASA-CR-137530; D6-41896) Avail: NTIS HC $7.00 CSCL 01C

The braking system for a short takeoff aircraft is discussed and the deficiencies are described. The installation of a Boeing 727 aircraft brake system was made to correct the deficiencies. Tests of the modified system were conducted using an analog computer/hardware simulator. Actual performance tests were conducted and the characteristics of the system were satisfactory. Author

N74-29375*# American Airlines, Inc., New York.
ASSESSMENT OF THE APPLICATION OF ADVANCED TECHNOLOGIES TO SUBSONIC CTOL TRANSPORT AIRCRAFT Final Report
J. D. Graef, G. P. Sallee, and J. T. Verges Aug. 1974 128 p refs
(Contract NAS1-12148)
(NASA-CR-132461) Avail: NTIS HC $9.50 CSCL 01C

Design studies of the application of advanced technologies to future transport aircraft were conducted. These studies were reviewed from the perspective of an air carrier. A fundamental study of the elements of airplane operating cost was performed, and the advanced technologies were ranked in order of potential profit impact. Recommendations for future study areas are given. Author

N74-29376# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
ACOUSTIC TESTS ON A FAN-IN-WING MODEL: EFFECTS OF AN EXTENDED INLET
G. Krishnappa Feb. 1974 58 p refs
(NRC-13898; LR-576) Avail: NTIS HC $6.00

The aerodynamic noise generated by the lifting fan in the fan-in-wing configuration of vertical takeoff aircraft is discussed. The effect of increasing the depth of the inlet on the noise characteristics of the fan at static and crossflow conditions is analyzed. The causes for aerodynamic noise under crossflow conditions are explained. The changes in noise tonal signature under crossflow conditions were investigated in a wind tunnel. Author

N74-29377# Brussels Univ. (Belgium). Inst. de Mecanique Appliquee.
OPTIMAL DIMENSION OF A BELL SHAPED HOVERCRAFT [DIMENSIONNEMENT OPTIMAL DES AEROGLISSEURS EN CLOCHE]
Andre L. Jaumotte, Andre Kiedrzynski, and Samuel Verbiese 1974 33 p refs In FRENCH
(NT-34) Avail: NTIS HC $4.75

The optimum design of a bell shaped hovercraft considering dimension, power, propulsion modes, and desired performance was examined. The FORTRAN program and formulas used to study the vehicle were included. Transl. by E.H.W.

N74-29378*# Cornell Univ., Ithaca, N.Y.
SONIC BOOM RESEARCH Final Technical Report, 1 Sep. 1967 - 31 Aug. 1974
A. Richard Seebass Aug. 1974 4 p refs
(Grant NGL-33-010-054)
(NASA-CR-138301) Avail: NTIS HC $4.00 CSCL 20A

The results of sonic boom research studies are presented. The purpose of the studies was as follows: (1) to minimize the sonic boom of supersonic transport aircraft, (2) to predict the distortion of the sonic boom signature by atmospheric turbulence, and (3) to predict the amplifications that occurs at a caustic, known as a superboom. The aircraft and meteorological parameters which can be used to predict sonic boom intensity are identified. A bibliography of publications on sonic booms is included. Author

N74-29379*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPPRESSOR NOZZLE AND AIRFRAME NOISE MEASUREMENTS DURING FLYOVER OF A MODIFIED F106B AIRCRAFT WITH UNDERWING NACELLES
Richard R. Burley 22 Nov. 1974 34 p refs Proposed for presentation at Winter Ann. Meeting of the Am. Soc. of Mech. Engr., New York, 17-22 Nov. 1974
(NASA-TM-X-71578; E-8028) Avail: NTIS HC $3.25 CSCL 23A

The effect of flight velocity on the jet noise and thrust of a 104-tube suppressor nozzle was investigated using an F-106B delta wing aircraft modified to carry two underwing nacelles each containing a turbojet engine. The nozzle was mounted behind one of the nacelles. Flight velocity had a large adverse effect on thrust and a small adverse effect on suppression when correlated with relative jet velocity. The clean airframe noise of the aircraft was measured at Mach 0.4 and was compared with that predicted from an empirical expression. The 83 db measured value was considerably below the predicted value. Author

N74-29380# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORTS. BRIEF FORMAT, US CIVIL AVIATION. ISSUE NUMBER 4 OF 1973 ACCIDENTS FILE NUMBERS: 3-2701 THRU 3-3312, 3-3314 THRU 3-3531, 3-3633 THRU 3-3600
9 May 1974 521 p
(NTSB-BA-74-2) Avail: NTIS HC $29.25

This publication contains selected aircraft accident reports in brief format, occurring in U. S. Civil Aviation operations during

calendar year 1973. The 898 General Aviation accidents contained in this publication represent a random selection. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot, certificate, injuries, and causal factors. Author

N74-29381# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORT: AMERICAN AIRLINES, INC., BOEING 707-323, N7595A AND A LINDEN FLIGHT SERVICE, INC., CESSNA 150, N60942 OVER EDISON, NEW JERSEY, JANUARY 9, 1971 Aircraft Accident Report, 9 Jan. 1971
3 Jul. 1974 18 p refs
(NTSB-AAR-72-16) Avail: NTIS HC $4.00

A midair collision involving a Boeing 707 and a Cessna 150 aircraft near Edison, New Jersey on 9 January 1971 is reported. The accident occurred at approximately 3,000 feet altitude. The 707 was on an instrument approach to the Newark Airport, Newark, New Jersey. The 707 landed at the Newark Airport without injury to the passengers or crew. Both occupants of the Cessna were killed as a result of the collision and subsequent crash. Author

N74-29382*# Lockheed-Georgia Co., Marietta.
STUDY OF STABILITY OF LARGE MANEUVERS OF AIRPLANES Final Report
Emile K. Haddad Washington NASA Aug. 1974 76 p refs
(Contract NAS1-11667)
(NASA-CR-2447) Avail: NTIS HC $4.00 CSCL 01B

A predictive method of nonlinear system analysis is used to investigate airplane stability and dynamic response during rolling maneuvers. The maneuver roll-rate is not assumed to be constant, and the airplane motion is represented by a set of coupled nonlinear differential equations. The general rolling maneuver is kinematically specified by its roll-rate variation p(t). A method for relating the airplane dynamic response to p(t) is developed. The method provides analytical expressions for the motion variables in terms of the maneuver descriptor p(t). A parameterized family of rolling maneuvers is considered, for which the method is used to predict specific dynamic response information, such as the dependence of the peak angle-of-attack excursion on the maneuver parameters. The stability and motion of the airplane in response to an arbitrary actuation of aileron input is considered. Analytical expressions relating motion variables to aileron input are obtained. Explicit analytical bounds on the motion variables are derived. A stability criterion which guarantees nondivergence of motion in response to aileron actuation is presented. Author

N74-29383*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ACOUSTIC AND AERODYNAMIC TESTING OF A SCALE MODEL VARIABLE PITCH FAN
R. R. Jutras and S. B. Kazin Mar. 1974 176 p refs
(Contract NAS3-12430)
(NASA-CR-121232; R73AEG196) Avail: NTIS HC $12.00 CSCL 01B

A fully reversible pitch scale model fan with variable pitch rotor blades was tested to determine its aerodynamic and acoustic characteristics. The single-stage fan has a design tip speed of 1160 ft/sec (353.568 m/sec) at a bypass pressure ratio of 1.5. Three operating lines were investigated. Test results show that the blade pitch for minimum noise also resulted in the highest efficiency for all three operating lines at all thrust levels. The minimum perceived noise on a 200-ft (60.96 m) sideline was obtained with the nominal nozzle. At 44% of takeoff thrust, the PNL reduction between blade pitch and minimum noise blade pitch is 1.8 PNdB for the nominal nozzle and decreases with increasing thrust. The small nozzle (6% undersized) has the highest efficiency at all part thrust conditions for the minimum noise blade pitch setting; although, the noise is about 1.0 PNdB higher for the small nozzle at the minimum noise blade pitch position. Author

N74-29384*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ACOUSTIC RESULTS OF SUPERSONIC TIP SPEED FAN BLADE MODIFICATION
R. R. Jutras and S. B. Kazin [1974] 160 p refs
(Contract NAS3-12430)
(NASA-CR-121233; R73AEG07) Avail: NTIS HC $11.00 CSCL 01B

A supersonic tip speed single stage fan was modified with the intent of reducing multiple pure tone (MPT) or buzz saw noise. There were three modifications to the blades from the original design. The modifications to the blade resulted in an increase in cascade throat area causing the shock to start at a lower corrected fan speed. The acoustic results without acoustically absorbing liners showed substantial reduction in multiple pure tone levels. However, an increase in the blade passing frequency noise at takeoff fan speed accompanied the MPT reduction. The net result however, was a reduction in the maximum 1000-foot (304.8 m) altitude level flyover PNL. For the case with acoustic treatment in the inlet outer wall, the takeoff noise increased relative to an acoustically treated baseline. This was largely due to the increased blade passing frequency noise which was not effectively reduced by the liner. Author

N74-29385*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC AND ACOUSTIC PERFORMANCE OF EJECTORS FOR ENGINE-UNDER-THE-WING CONCEPTS
U. VonGlahn, J. Goodykoontz, and D. Groesbeck 1974 47 p refs Presented at the Sixth Aircraft Design, Flight Test and Operations Meeting, Los Angeles, 12-14 Aug. 1974; Sponsored by the American Institute of Aeronautics and Astronautics
(NASA-TM-X-71587; E-8039) Avail: NTIS HC $3.25 CSCL 01C

Subsonic thrust augmentation, exhaust plume velocity contours and acoustic characteristics of a small-scale, 6-tube mixer nozzle with ejector were obtained with and without a wing. Thrust augmentation up to 30 percent was achieved. Aerodynamic results showed that at a given location, greater downstream velocities are obtained with an ejector than with the baseline nozzle. Ejectors reduce high frequency noise; however, low frequency noise amplification also occurs. Acoustic reflections off the wing increase the noise level to a ground observer. With an ejector, the acoustic benefits of forward velocity may be significantly reduced compared with the baseline nozzle. Author

N74-29386# Naval Postgraduate School, Monterey, Calif.
AN INTERACTIVE GRAPHICS APPROACH TO THE FLIGHT DECK HANDLING PROBLEM M.S. Thesis
Thomas Joseph Giardina, II Mar. 1974 99 p refs
(AD-778635) Avail: NTIS CSCL 05/8

Present communication networks aboard aircraft carriers introduce inefficiency into the aircraft handling operation. A previous study, named CADOCS, failed to solve the problem by a method involving computer simulation. This study proposes a solution to the aircraft handling problem by use of a system of computer graphics terminals and interactive or man-in-the-loop programming. The study includes a proposed communication network, a discussion of the types of computer graphics hardware now available, a discussion of interactive programming, and a preliminary computer graphics program for two displays in the proposed system. Author (GRA)

N74-29387# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A DIGITAL FLUTTER MODE CONTROLLER FOR LARGE FLEXIBLE BODIED AIRCRAFT M.S. Thesis
James A. Sellner Mar. 1974 204 p refs
(AD-779763; GE/EE/74M-17) Avail: NTIS CSCL 01/3

A digital flutter mode control system (FMCS) was designed for a large flexible-bodied aircraft. The NB-52E was selected as the model because it was previously used in the design of a continuous-time FMCS by the Air Force Flight Dynamics Laboratory. The mathematical model was reduced to a workable size by eliminating the sensors and control surfaces not used in the design, and by truncating the high-frequency bending modes. The transfer functions for the flaperon and outboard aileron control loops were obtained, and root-locus techniques were used to synthesize feedback filters. A suitable sampling time was selected, and the feedback filters were converted to recursion equations

using the Tustin algorithm. A digital simulation program was written to obtain the open and closed-loop time responses of the aircraft. (Modified author abstract) GRA

N74-29388# Minnesota Univ., Minneapolis.
DEVELOPMENT OF A TOTAL TRAJECTORY SIMULATION FOR SINGLE RECOVERY PARACHUTE SYSTEMS. VOLUME 1: ANALYTICAL MODEL AND COMPUTER PROGRAM DESIGN RATIONALE Final Report, Nov. 1971 - Jun. 1973
Helmut G. Heinrich, Robert A. Noreen, and David P. Saari Dec. 1973 119 p refs
(Contract DAAG17-72-C-0030; DA Proj. 1F1-62203-AA-3304) (AD-779527; USA-NLABS-TR-74-9-AD-Vol-1) Avail: NTIS CSCL 01/3

A method of total trajectory simulation was established which is based on the governing equations of the various phases of an airdrop or recovery system. In view of these equations, a computer program capable of predicting the performance characteristics of a parachute-load system from the instant of initiation to the moment of landing was established. Calculations were performed for a number of different aerial delivery systems. The calculated results fall well within the broad ranges of expected performance, based upon a familiarity with field test results. (Modified author abstract) GRA

N74-29389# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPLICATION OF SAMPLED-DATA CONTROL TECHNIQUES IN THE DESIGN OF AN AIRCRAFT FLUTTER MODE CONTROLLER M.S. Thesis
James P. Balma Mar. 1974 176 p refs
(AD-779078; GE/EE/74M-1) Avail: NTIS CSCL 01/2

The problem of designing a sampled-data flutter mode controller using optimal control techniques is investigated. The plane being controlled is the Control Configured Vehicle NB-52. The continuous equations of motion about the longitudinal aircraft axis are discretized by the state transition method. Using the discrete equations of motion the discrete linear regulator problem is solved. An acceptable set of quadratic weightings is developed for the full-state feedback problem. Full-state feedback is not physically realizable so it is necessary to solve the suboptimal problem. The infinite time discrete linear stochastic regulator problem is developed and solved. The radient derived in this development is used in a performance minimization by conjugate gradients algorithm to derive the best suboptimal feedback gains. A digital simulation is performed that demonstrates a successful design. Author (GRA)

N74-29390# Army Aviation Systems Command, St. Louis, Mo.
A COMPUTER MODEL FOR ECONOMIC ANALYSIS OF ARMY AIRCRAFT RAM IMPROVEMENT PROPOSALS Final Report
Tony Kassos Mar. 1974 97 p refs
(AD-778751; USAAVSCOM-TR-74-19) Avail: NTIS CSCL 01/3

The report has been prepared for presentation to the Joint AMC/TRADOC RAM Seminar scheduled for 4th Quarter, FY 1974, at Ft. Lee, Virginia. AR 702-3, Army Material Reliability, Availability, and Maintainability (RAM), 22 March 73 places increased emphasis on the cost impact of RAM efforts. This division was invited by the seminar sponsors to deliver a presentation on an economic analysis model developed here and to discuss how it could be applied to RAM cost studies. This report is in response to this request. A computer model is presented for preparing the cost trade off studies of RAM efforts required by AR 702-3. The model is specifically directed to RAM efforts involving Army aircraft. It determines the total life cycle cost impact of a RAM effort and pertinent RAM parameters. It is a modification of the economic analysis model mentioned above and is a preliminary effort to combine the methodologies of cost analysis and product assurance. Author (GRA)

N74-29391# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ANNOTATED BIBLIOGRAPHY FOR SCIENTIFIC BALLOONING
Catherine B. Rice 16 Jan. 1974 105 p refs
(AF Proj. 6665)
(AD-779686; AFCRL-SR-171; AFCRL-TR-74-0040) Avail: NTIS CSCL 04/1

The annotated bibliography has evolved from an informal compilation prepared in response to many requests from military and civilian researchers who were planning balloon-borne experiments and searching for data or detailed information concerning some specific aspects of modern scientific ballooning operations. The bibliography consists of three parts: a subject index, an author index, and the bibliography with annotations. GRA

N74-29392# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN OF A CONTROL SYSTEM TO STABILIZE THE AFT FUSELAGE OF A B-52 BOMBER IN THE PRESENCE OF A RANDOM WIND GUST M.S. Thesis
Charles A. Harrington, III Mar. 1974 103 p refs
(AD-779081; GE/EE/74M-5) Avail: NTIS CSCL 01/2

A control system was designed to stabilize the flexible aft-body of a B-52 bomber, under the influence of a 1.0 ft/sec rms vertical wind gust. Optical instruments, mounted in the aft-body, can therefore be aimed more accurately, and with a less complex aiming device, because of the improvement in stability due to the control system. The aircraft transfer functions, which include the effects of the first seven bending modes, were obtained using digital computer programs provided by the Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio, and data and equations provided by the Boeing Aircraft Corporation. The open-loop pitch-rate and normal acceleration responses to the wind gust were determined using a digital computer program called MIMIC, which simulates the functions of an analog computer. The design procedure uses the principle of superposition to minimize the effects of a wind gust disturbance on the aircraft. (Modified author abstract) GRA

N74-29393# McDonnell-Douglas Corp., Long Beach, Calif.
WINDSHIELD BIRD STRIKE STRUCTURE DESIGN CRITERIA Final Report, 2 Oct. 1972 - 1 Aug. 1973
James H. Lawrence, Jr. and Murl J. Coker Oct. 1973 259 p refs
(Contract F33615-73-C-3030; AF Proj. 4363)
(AD-779729; AFFDL-TR-73-103) Avail: NTIS CSCL 01/2

The study determines the inadequacies of existing bird impact design criteria for windshield/canopies and support structure. Second, it establishes recommended design criteria for future aircraft, particularly those involved in high speed-low level training missions. The methods used in the study were primarily that of collecting, examining, and selecting pertinent data from a multitude of sources on birds and their behavior aircraft/bird incidents, and aircraft design criteria. Procedures are proposed for USAF aircraft designed to inadequate or no bird impact requirements. Of particular value are avoidance and alleviation techniques for reduction of the inviting bird environment surrounding airports, improved use of radar and other mechanical devices to predict/determine the presence of dangerous bird and/or flock sizes. Recommended design criteria for subsequent design of windshields/canopies and support structure are presented. (Modified author abstract) GRA

N74-29394# Bell Aerospace Co., Buffalo, N.Y.
A TWO DIMENSIONAL TEST OF A SINGLE BAY COLD THRUST AUGMENTATION EJECTOR WING Final Report
H. G. Streiff, R. Ashby, and V. Krishnamoorthy Mar. 1974 145 p refs
(Contract F33615-73-C-3128; AF Proj. 1207)
(AD-779713; BAC-7500-933010; AFFDL-TR-74-4) Avail: NTIS CSCL 01/3

A two dimensional model of a single bay cold thrust augmentation ejector wing designed and built by Bell Aerospace Company and utilizing hypermixing nozzles developed by the Aerodynamic Research Laboratory of Wright Patterson Air Force Base was tested both statically and at speed in the Lockheed-Georgia low speed wind tunnel facility. The wing was tested at flap angles of 20 and 30 degrees at airspeeds from 0 to 165 fps and through an angle of attack range of -10 to -32 degrees. The ejector primary pressure ratio was varied from 1.0 to 2.25 and the diffuser area ratio was varied from 1.3 to

2.0. The report presents a detailed description of the model including its air supply and instrumentation systems, the test facility and data reduction equations and methodology. Also, presented is the detailed run schedule, the data limitations and the resulting plotted data. Author (GRA)

N74-29395# Lockheed-California Co., Burbank.
LOW NOISE PROPELLER TECHNOLOGY DEMONSTRATION Final Technical Report, 15 Feb. 1973 - Jan. 1974
Edward D. Griffith and James D. Revell Jan. 1974 202 p refs
(Contract F33615-73-C-2045; AF Proj. 3066)
(AD-779773; AFAPL-TR-73-115) Avail: NTIS CSCL 20/1

Quiet aircraft used for covert aerial night reconnaissance employ low tip speed propellers to achieve a minimum acoustic noise signature. This study was initiated when certain unexpected and anomalous trends in the measured propeller noise of such aircraft were compared to predictions of noise made by the Air Force Propeller Noise Prediction Program. Large discrepancies in both trends and levels were noted between measured and predicted noise. Therefore, the goal of this study was the modification of an existing Air Force computer program such that accurate predictions of far field noise for low tip speed propellers can be made. Empirical data from previous quiet airplane experiments were used to develop modifications to both rotational and vortex noise prediction methods for propellers operating in the tip speed range from Mach 0.2 to 0.4. (Modified author abstract) GRA

N74-29396# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
ADDITIONAL STUDIES, VARIABLE CAMBER WING, PHASE 1 Final Report, Jul. 1973 - Jan. 1974
Douglas Gould Feb. 1974 47 p refs
(Contract N00014-73-C-0244)
(AD-779041; D180-17606-2) Avail: NTIS CSCL 01/3

A smooth variable camber wing system using flexible skins has been designed for fighter and attack airplanes. Comparisons of this system with other systems such as leading edge slats, plain flaps, canards and the box wing illustrate its overall performance superiority. Estimates of the performance improvements which result when smooth curved variable camber flaps are applied to the F-8, F-4, A-7, F-14, and S-3 show that any of these aircraft could benefit from the addition of this system. Author (GRA)

N74-29397# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
DEVELOPMENT OF AN EMPIRICALLY BASED COMPUTER PROGRAM TO PREDICT THE AERODYNAMIC CHARACTERISTICS OF AIRCRAFT. VOLUME 2: PROGRAM USER GUIDE Final Report, Dec. 1972 - Oct. 1973
Roy T. Schemensky Nov. 1973 223 p
(Contract F33615-73-C-3043; AF Proj. 1476)
(AD-779737; AFFDL-TR-73-144-Vol-2) Avail: NTIS CSCL 01/3

The report (Volume II, Program User Guide) describes the computer program developed for the evaluation of the aerodynamic characteristics of large aircraft (bombers, tankers, and transports). The program calculates lift, moment, and drag characteristics of aircraft through the subsonic, transonic, and supersonic speed regimes, and includes the capability of calculating the effect of high-lift systems in both free air and in ground effect for landing and takeoff. The input to the computer program requires the configuration geometry and the aerodynamic conditions for which solutions are desired. The program includes the capability of analyzing both fixed-wing and variable-sweep-wing configurations as well as the aerodynamic characteristics of supercritical wing designs. (Modified author abstract) GRA

N74-29398# Army Aviation Systems Test Activity, Edwards AFB, Calif.
ARTIFICIAL ICING TESTS UH-1H HELICOPTER. PART 2: HEATED GLASS WINDSHIELD Final Report
Warren E. Griffith, II, Carl F. Mittag, Marvin L. Hanks, and Michael A. Hawley Jan. 1974 24 p
(USAASTA Proj. 73-04-4)
(AD-779503) Avail: NTIS CSCL 01/3

The United States Army Aviation Systems Test Activity conducted a limited evaluation of a heated glass UH-1H helicopter windshield from 3 January through 8 January 1974. The evaluation was performed at Edwards Air Force Base, California using the helicopter icing spray system and consisted of two productive flights for a total of 1.1 productive flight hours. One shortcoming was noted: restricted upward and downward forward field of view through the heated UH-1H windshield after exposure to an artificial icing environment. Within the scope of this test, the heated portion of the heated glass UH-1H windshield provides a satisfactory anti-ice/deice capability when flying in an icing environment. Further evaluation should be conducted to determine the optimum size, shape, and location of the heated portion of the windshield and to determine if electrical requirements for two windshields are compatible with UH-1H mission electrical loads. Author (GRA)

N74-29399# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
FIGHTER TECHNOLOGY DEMONSTRATOR PERCURSOR ANALYSIS AND TEST. VOLUME 2: AN EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A FIGHTER TECHNOLOGY DEMONSTRATOR JET FLAP DEVELOPMENT MODEL AT LOW SUBSONIC MACH NUMBER Final Report, May - Oct. 1973
G. N. Panageas Nov. 1973 112 p refs
(Contract F33615-73-C-3135; AF Proj. 1207)
(AD-779742; AFFDL-TR-73-112) Avail: NTIS CSCL 01/3

A subsonic wind tunnel test of a small-scale fighter technology demonstrator development model was conducted to obtain data instructive in refining and developing the configuration. Tests were performed at Mach 0.23 through high angles of attack and at angles of sideslip for various geometric alterations to the configuration to evaluate their impact on the design aerodynamics. Flow surveys were conducted to evaluate flow fields at potential inlet locations. Additional tests were conducted, with a secondary air source providing thrust, for a jet flap arrangement at the wing trailing edge. This jet flap configuration incorporates the features of an aerodynamic flap and jet flap in that the turning action of the conventional mechanical flap also directs the jet efflux. Deflection angles of the jet were 0, 10, 20, and 30 degrees for two flap spans. (Modified author abstract) GRA

N74-29400# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.
SKIN FRICTION DRAG REDUCTION BY COMPLIANT COATINGS Final Report, Sep. 1965 - May 1974
Edward F. Blick May 1974 30 p refs
(Contract DA-31-124-ARO(D)-349)
(AD-779544; AROD-5596-12-E) Avail: NTIS CSCL 01/1

Research on skin friction reduction by compliant coating conducted at the University of Oklahoma during the past eight years is reviewed. At the University of Oklahoma wind tunnel experiments showed that compliant coatings composed of a thin sheet of polyvinyl chloride covering either a thin layer of liquid or a thin layer of polyurethane foam reduced the turbulent skin friction drag by as much as 40% on flat plates. Hot wire anemometer measurements also indicated corresponding reductions in Reynolds stresses and turbulence intensities in the boundary layer. An NACA 0009 airfoil was found to have as much as 30% less drag when equipped with a polyvinyl chloride-polyurethane foam compliant coating. Author (GRA)

N74-29401# Lockheed-California Co., Burbank.
ANALYSIS OF MANEUVERABILITY EFFECTS ON ROTOR/WING DESIGN CHARACTERISTICS Final Report, 1970
N. B. Gorenberg and W. P. Harvick Feb. 1974 263 p refs
(Contract DAAJ02-70-C-0032; DA Proj. 1X1-64206-D-378)
(AD-779448; LR-24051; USAAMROL-TR-74-24) Avail: NTIS CSCL 01/3

An analytical study was performed to contribute toward design criteria for the Utility Tactical Transport Aircraft System (UTTAS) through an analysis of maneuvers to determine effects of the maneuvers on helicopter design characteristics. Maneuverability requirements examined were combinations of maximum flight speeds and maneuvering load factors and sustained high load factors for long periods of time as might be expected in nap-of-the-earth flying. The study included analyses to examine

the possibility of gaining maneuver capability at high speeds by adding wings to helicopters. Analysis of results showed no large difference between winged and nonwinged helicopters. Those differences that did emerge, however, were in favor of adding the wing. Whether or not these differences would become more significant through additional design iterations of a particular design is not yet clear. Author (GRA)

N74-29402# Lockheed-California Co., Burbank.
APPLICATION OF AN INTERDISCIPLINARY ROTARY WING AIRCRAFT ANALYSIS TO THE PREDICTION OF HELICOPTER MANEUVER LOADS Final Report, Jun. 1972 - Jun. 1973
William D. Anderson, Fox Conner, and Andrew W. Kerr Dec. 1973 420 p refs
(Contract DAAJ02-72-C-0100; DA Proj. 1F1-62208-AA-82)
(AD-779449; LR-25945; USAAMRDL-TR-73-83) Avail: NTIS CSCL 01/3

A complete understanding of the factors which establish the flight envelope of a helicopter requires simultaneous consideration of power, static and dynamic stability, handling qualities, and pilot techniques as well as resulting loads and vibration levels. To facilitate this understanding, an interdisciplinary mathematical model that provides analytical prediction of free-flight characteristics of single-rotor helicopter and compound helicopter configurations has been developed. The work described in this report presents a loads correlation of the current (REXOR II) program with existing AH-56A and XH-51A (compound) test data with primary focus on steady and cyclic loads during steady and transient maneuvers. GRA

N74-29403# Southwest Research Inst., San Antonio, Tex.
ENGINEERING APPRAISAL OF SwRI MAGNETIC CRACK DEFINER APPLIED TO CH-47 ROTOR BLADES: VERIFICATION ADDENDUM Final Report, 1 Feb. - 31 Mar. 1974
J. Robert Birchak, John R. Barton, and Gary L. Burkhardt May 1974 38 p refs
(Contract DAAJ01-73-C-0533)
(AD-779497; SwRI-15-3653; USAAVSCOM-TR-74-9) Avail: NTIS CSCL 01/3

This addendum effort evaluates the Magnetic Crack Definer (MCD) and an ultrasonics system on CH-47 helicopter rotor blade spars to determine the capabilities for detecting fatigue cracks under the ferromagnetic steel doubler plates and to determine possible sources of false alarms. Although attempts to adapt the MCD to doubler plates were unsuccessful, a supplementary ultrasonics procedure developed during the program can inspect all spar material in the doubler regions. The remaining outboard regions were inaccessible to ultrasonics due to overlaying materials. These outboard regions are accessible, however, to the MCD which accommodates as much as 0.1 inch of lift-off due to nonferromagnetic overlays. (Modified author abstract) GRA

N74-29404# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HANDBOOK FOR THE AVIATION REAR SPECIALIST
A. G. Blok, V. K. Buzunov, S. B. Neroslev, and I. Ya. Skorkin 10 Apr. 1974 548 p refs Transl. into ENGLISH from the book "Spravochnik Spetsealista Tyla Aviatsii" USSR, 1972 p 5-499
(AD-779172; FTD-MT-24-604-73) Avail: NTIS CSCL 01/3

A handbook for military specialists involved in rear provisioning of aviation units and their subdivisions is presented. The handbook is also useful for managerial, technical, and engineering personnel and for specialists in ground based logistic services of civil and official government aviation. Some of the subjects discussed are: (1) operational maintenance of airfields; (2) airfield provisioning; and (3) technical support of flights. Data are presented which reflect the peculiarities of solving military logistics problems. Author

N74-29405# Goodrich (B. F.) Co., Akron, Ohio. Aerospace and Defense Products.
RUN FLAT TIRE FOR C-130 AIRCRAFT Final Report, Nov. 1971 - Jun. 1973
James W. Pond Aug. 1973 40 p
(Contract F33615-72-C-1191; AF Proj. 1369)
(AD-779728; AFFDL-TR-73-82) Avail: NTIS CSCL 01/3

Four different constructions in 38.5/28x13-16 size folding sidewall tires were manufactured and evaluated under static and dynamic conditions. All constructions showed no bead unseating on static test. However, all constructions showed unseating on dynamic tests. For the various design constructions investigated during Phase I, results showed that an acceptable level was not achieved in improving the 12.50x16 folding sidewall tire's bead seat - run flat operation. For this reason, it was necessary to proceed with bead unseating force measurements, the Phase II alternate approach. (Modified author abstract) GRA

N74-29406# Human Engineering Labs., Aberdeen Proving Ground, Md.
A LITERATURE REVIEW OF COCKPIT LIGHTING Final Technical Memorandum
Alan M. Poston Apr. 1974 27 p
(AD-779407; HEL-TM-10-74) Avail: NTIS CSCL 01/3

The report contains a compilation of data from a review of the available literature on the subject of cockpit lighting. The purpose of this review is to pinpoint areas where sufficient results have been obtained to prevent the repetition of similar studies. It is also the intent of the report to point out areas where future research is needed before improvements in current lighting systems can be made. The major areas of discussion are red versus white, major cockpit lighting problems, auxiliary lighting, glare reduction, luminance levels and legibility, and future considerations. Within each section, conclusions and recommendations have been made based on the information presented. Author (GRA)

N74-29407# Minnesota Univ., Minneapolis.
DEVELOPMENT OF A TOTAL TRAJECTORY SIMULATION FOR SINGLE RECOVERY PARACHUTE SYSTEMS. VOLUME 2: CALCULATION PROCEDURES AND COMPUTER PROGRAM Final Report, 15 Nov. 1971 - 30 Jun. 1973
Robert A. Noreen and David P. Saari Dec. 1973 249 p refs
(Contract DAAG17-72-C-0030; DA Proj. 1F1-62203-AA-33)
(AD-779528; USA-NLABS-TR-74-9-AD-Vol-2) Avail: NTIS CSCL 01/3

A method of total trajectory simulation was established which is based on the governing equations of the various phases of an airdrop or recovery system. In view of these equations, a computer program capable of predicting the performance characteristics of a parachute-load system from the instant of initiation to the moment of landing was established. Calculations were performed for a number of different aerial delivery systems. The calculated results fall well within the broad ranges of expected performance, based upon familiarity with field test results. In Volume I, simulation methods and numerical calculation results are presented; in Volume II details of the calculation procedures and computer program are presented. (Modified author abstract) GRA

N74-29408# Army Aviation Systems Command, St. Louis, Mo.
EXECUTIVE SUMMARY REPORT ON QUALITY AND COMMAND PROGRAM ASSESSMENTS Final Report
May 1974 60 p
(AD-779518; USAAVSCOM-TR-74-25) Avail: NTIS CSCL 01/3

The purpose of the executive summary is to supplement the management summary report. The quality and command program assessment portion of this report is designed to provide an overall picture of quality on aircraft or components. The report assesses quality-related problems experienced in the field by the user as well as quality problems occurring at the Army plant activities, and their impact on delivery schedules to the user. Quality and command program assessments are covered in this report. MDS assessment and comparative fleet evaluations, command statistics and problem summary, are covered in a companion report. Author (GRA)

N74-29409# Army Aviation Systems Command, St. Louis, Mo.
EXECUTIVE SUMMARY REPORT ON CH-54A ASSESSMENT AND COMPARATIVE FLEET EVALUATIONS Final Report
May 1974 95 p
(AD-779517; USAAVSCOM-TR-74-24) Avail: NTIS CSCL 01/3

The purpose of the executive summary is to supplement the management summary report. It is an overview and summarization of the material contained therein. The parameters presented provide management perspective of the CH-54A fleet, in addition to comparative fleet evaluations. Various presentations of RAM related parameters give the present system posture of the CH-54A fleet. MDS assessment and comparative fleet evaluations are covered in this report. Quality and command program assessments and the command statistics and problem summary are the other reports which make up the total executive summary for the CH-54A. Author (GRA)

N74-29815* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF THE VIBRATIONS OF COMPLEX ROTOR SYSTEMS
I. Yu. Yugraytis, K. M. Ragulskis, Rem. A. Ionushas, and I. P. Karuzhene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 100-102 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 94-96 (For availability see N74-29785 19-15)
CSCL 01C

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-29410* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLAME DETECTOR OPERABLE IN PRESENCE OF PROTON RADIATION Patent
Dayton J. Walker (McDonnell-Douglas Corp., Huntington Beach, Calif.), John E. Turnage (McDonnell-Douglas Corp., Huntington Beach, Calif.), Rodney M. F. Linford (McDonnell-Douglas Corp., Huntington Beach, Calif.), and Steve D. Cornish, inventors (to NASA) (McDonnell-Douglas Corp., Huntington Beach, Calif.) Issued 23 Jul. 1974 10 p Filed 21 Mar. 1973 Supersedes N73-20042 (11 - 11, p 1237) Sponsored by NASA
(NASA-Case-MFS-21577-1; US-Patent-3,825,760; US-Patent-Appl-SN-343308; US-Patent-Class-250-372; US-Patent-Class-250-394) Avail: US Patent Office CSCL 01C

A detector of ultraviolet radiation for operation in a space vehicle which orbits through high intensity radiation areas is described. Two identical ultraviolet sensor tubes are mounted within a shield which limits to acceptable levels the amount of proton radiation reaching the sensor tubes. The shield has an opening which permits ultraviolet radiation to reach one of the sensing tubes. The shield keeps ultraviolet radiation from reaching the other sensor tube, designated the reference tube. The circuitry of the detector subtracts the output of the reference tube from the output of the sensing tube, and any portion of the output of the sensing tube which is due to proton radiation is offset by the output of the reference tube. A delay circuit in the detector prevents false alarms by keeping statistical variations in the proton radiation sensed by the two sensor tubes from developing an output signal. Official Gazette of the U.S. Patent Office

N74-29411*+ New Mexico Univ., Albuquerque. Energy Information Center.
HYDROGEN ENERGY: A BIBLIOGRAPHY WITH ABSTRACTS. CUMULATIVE VOLUME, 1953 - 1973
Kenneth E. Cox 1 Jan. 1974 633 p refs Sponsored by NASA
(NASA-CR-138940; TAC-H-74-500) Avail: NTIS HC $34.75 CSCL 10A

A bibliography on hydrogen as an energy source is presented. Approximately 8,000 documents are abstracted covering the period 1953 through 1973. Topics covered include: production, utilization, transmission, distribution, storage, and safety. E.J.O.

N74-29412*# Gould, Inc., Mendota Heights, Minn. Energy Research.
FABRICATION AND TESTING OF NEGATIVE-LIMITED SEALED NICKEL-CADMIUM CELLS
D. J. Gordy 28 May 1974 11 p refs
(Contract NAS7-100; JPL-953680)
(NASA-CR-139374; Rept-732-015-3) Avail: NTIS HC $4.00 CSCL 10C

Negative-limited sealed nickel-cadmium cells are a possible means toward increasing the life of nickel-cadmium cells to about a decade or more. The purpose of this program is to design, construct, and test 100, 20 Ah and 100, 30 Ah negative-limited sealed cells. The cell design was completed and hardware was ordered during the first quarter. Electrode fabrication was started in the first quarter and carried on through the second quarter. The fabrication and selection of the necessary electrodes has been completed during the third quarter. Cell construction has been completed and the preparatory cell cycling is underway. The preliminary testing to select the initial delivery cell has been started. Author

N74-29413*# TRW Systems Group, Redondo Beach, Calif.
DEVELOPMENT OF A UNINTERRUPTED POWER SYSTEM: ac AND dc TO dc CONVERTER
D. L. Cronin and A. D. Schoenfeld Jul. 1973 30 p refs
(Contract NAS3-15827)
(NASA-CR-134497) Avail: NTIS HC $4.50 CSCL 10B

This program covered the design, fabrication and testing of an advanced development model uninterrupted power system. The input and output requirements imposed on the power processor were specified such that the unit is electrically interchangeable with existing power systems used by the Federal Aviation Administration in installations which have a history of failure due to electrical transient conditions. Input power is from either of two single-phase ac power sources or batteries with electronic selection and transfer between power sources. Battery reconditioning is automatic when either ac source is present. The output power is rated at 840W; the nominal output is 24V at 35A. Within the 840W limit, the regulated output voltage is adjustable from 22V to 30Vdc. Protection against continuous overloading or short circuit is provided. The unit is packaged in a standard 19-inch rack mount configuration with 7-inch panel height. Controls are on the front panel with power input and output through connectors on the rear surface. Cooling is by free convection from fin areas located on the side and rear panels. The packaged unit weighs 52.8 lbs., which can be reduced significantly if a three-phase ac power source is used. Author

N74-29414*# Pennsylvania State Univ., University Park.
ELECTRODE KINETICS OF A WATER VAPOR ELECTROLYSIS CELL Final Report, 15 Aug. 1971 - 30 Jun. 1974
Geoffrey Jacobs Jul. 1974 157 p refs
(Grant NGR-39-009-123)
(NASA-CR-139369) Avail: NTIS HC $11.00 CSCL 10A

The anodic electrochemical behavior of the water vapor electrolysis cell was investigated. A theoretical review of various aspects of cell overvoltage is presented with special emphasis on concentration overvoltage and activation overvoltage. Other sources of overvoltage are described. The experimental apparatus controlled and measured anode potential and cell current. Potentials between 1.10 and 2.60 V (vs NHE) and currents between 0.1 and 3000 mA were investigated. Different behavior was observed between the standard cell and the free electrolyte cell. The free electrolyte cell followed typical Tafel behavior (i.e. activation overvoltage) with Tafel slopes of about 0.15, and the exchange current densities of 10 to the minus 9th power A/sq cm, both in good agreement with literature values. The standard cell exhibitied this same Tafel behavior at lower current densities but deviated toward lower than expected current densities at higher potentials. This behavior and other results were examined to determine their origin. Author

N74-29415*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE NASA PROGRAM FOR STANDARDIZING SILICON SOLAR CELLS
W. J. Bifano and A. F. Forestieri Aug. 1974 3 p ref Presented at the 9th Intersoc. Energy Conversion Eng. Conf., San Francisco,

26-30 Aug. 1974
(NASA-TM-X-71563; E-7995) Avail: NTIS HC $3.00 CSCL 10A

The program is discussed which was initiated to formulate standard silicon solar cell and cover specifications. The program includes (1) compilation of solar cell and cover specifications, both past and present (2) elicitation of inputs from major users and suppliers and (3) establishment of tentative standardized solar cell and cover specifications. Author

N74-29416*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ELECTROLYTIC CELL DESIGN Patent Application
David F. Putnam (McDonnell-Douglas Corp.) and Richard L. Vaughan, inventors (to NASA) (McDonnell-Douglas Corp.) Issued 8 Feb. 1974 10 p Sponsored by NASA
(NASA-Case-LAR-11042-1; US-Patent-Appl-SN-440916) Avail: NTIS HC $4.00 CSCL 10A

An electrolytic cell is made up of a stack of polysulfone plates faced with sheets of platinum bonded by silicone rubber and mechanically secured to their plates by Teflon screws having heads serving as spacers between opposed platinum sheets. NASA

N74-29417*# Linguistic Systems, Inc., Cambridge, Mass.
SEA'S EXAMINATION OF WINDPOWER IN 1952: CHANGE OF A WIND POWER MILL FROM DIRECT CURRENT TO ALTERNATING CURRENT PRODUCTION
J. Juul Washington NASA Jul. 1974 19 p Transl. into ENGLISH from Elektroteknikeren (Copenhagen), no. 10, 22 May 1953 p 193-197
(Contract NASw-2482)
(NASA-TT-F-15439) Avail: NTIS HC $4.00 CSCL 10A

A wind power mill built in 1942 in Denmark is described. Various factors influencing the amount of electricity supplied by the mill are indicated. An experiment is described for changing the mill so that it could produce alternating current to be channeled into SEAS's high voltage cable. The principal wiring diagram for the wind power mill is depicted. Author

N74-29418# Bureau of Mines, Morgantown, W.Va.
BUREAU OF MINES ENERGY PROGRAM, 1973
John D. Spencer and Bill Linville 1974 80 p refs
(BM-IC-8651) Avail: NTIS HC $7.00

Research on the development of new and improved methods for the discovery and production of oil and gas and production of fluid fuels from coal continued to be the major thrust of the Bureau of Mines energy research program during 1973. Crude oil recovery from tar sands and oil shale also retained a high priority in this work. Complementing this program were numerous studies aimed at accomplishing the objective of increased energy output with greater safety and minimum harm to the natural environment. Research objectives and results are summarized and formal publications of the Bureau of Mines on energy and related subjects are itemized. Author

N74-29419# Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.
GASIFICATION AND LIQUEFACTION OF KENTUCKY Annual Report, 1 Jul. 1972 - 30 Jun. 1973
O. W. Stewart and V. K. Dhir Dec. 1973 56 p refs Sponsored by the Dept. of Commerce, Frankfort, Ky.
Avail: NTIS HC $6.00

The feasibility for gasification and liquefaction of Kentucky coals is considered. The relationships between availability and the economics of production and transportation of coal and its conversion products are explored in some detail. In this regard, the present network of waterways, rail, and truck transportation, and large scale fluid pipelines to major consuming areas are analyzed. Author

N74-29420# National Science Foundation, Washington, D.C.
SOLAR ENERGY PROGRAM
A. J. Eggers, Jr. 13 Nov. 1973 223 p refs
(WASH-1281-9) Avail: NTIS $14.25

Development of proof-of-concept experiments and demonstration projects are discussed for each of the following subprograms of the Solar Energy Program: (1) heating and cooling of buildings; (2) solar-thermal conversion; (3) wind energy conversion; (4) ocean-thermal conversion; (5) bioconversion; and (6) photovoltaic conversion. The objectives, particularly those of widespread application and commercialization, that will have been accomplished by 1979 are specifically delineated. Each of the six programs is analyzed under the following headings: (1) subprogram summary; (2) status of technology; (3) rationale for Federal involvement and institutional arrangements for implementation; (4) criteria and priorities; (5) alternative research and development programs; and (6) implementation. Research and project titles, and submitting organization of the proposals considered by the panel are listed. NSA

N74-29421# Naval Postgraduate School, Monterey, Calif.
HYDRAULIC RAM SHOCK PHASE EFFECTS ON FUEL CELL SURVIVABILITY M.S. Thesis
Leslie George Kappel Mar. 1974 60 p refs
(AD-777879) Avail: NTIS CSCL 13/4

Hydraulic ram concerns the dynamic loading and catastrophic failure of liquid filled fuel tanks impacted by high speed projectiles. Hydraulic ram is divided into two phases: shock phase and cavity phase. The shock phase was studied. Theoretical predictions of shock radius versus time were compared with experimental results. The theory was found to be reasonably accurate for blunt shaped projectiles. (Modified author abstract) GRA

N74-29422# Carnegie-Mellon Univ., Pittsburgh, Pa.
DRAINAGE SYSTEMS FOR CONDENSATION
Clarence Zener and Abraham Lavi 1973 38 p refs
(Grant NSF GI-39114)
(PB-227967/7; NSF-RA/N-73-061) Avail: NTIS HC $3.25 CSCL 10B

Efficient condensing surfaces are highly desirable in the design of solar sea power plants using the ocean temperature difference. This paper examines a number of surface designs and presents a convenient method for optimizing the design. Author (GRA)

N74-29423# Texas Univ., Austin. Bureau of Economic Geology.
TOWARD A NATIONAL POLICY ON ENERGY RESOURCES AND MINERAL PLANT FOODS
Samuel P. Ellison, Jr. 1973 138 p refs
(PB-230248/7) Avail: NTIS HC $4.75 CSCL 10A

A report is made on the first of the university conferences concerning what our national policy should be on oil, gas, coal, nuclear, geothermal, solar sources on energy resources and on all varieties of mineral plant foods. Directions on what policy should be taken on educational endeavor are included. GRA

N74-29424# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
RESEARCH ON LOW COST SILICON SOLAR CELL STRUCTURE FOR LARGE ELECTRICAL POWER SYSTEMS Semiannual Progress Report, 1 Jan. - 30 Jun. 1973
P. H. Fang Sep. 1973 19 p
(Grant NSF GI-34975)
(PB-228879/3; NSF/RA/N-73-057;
NSF-RANN/SE/GI-34975-73-2) Avail: NTIS HC $3.00 CSCL 10B

A wide variety of steel substrates, as well as molybdenum and tungsten substrates, were investigated for the deposition of Si films. It was concluded that Si film with a nominal thickness of 10 microns can be grown on all these metal substrates. Si films with preferential orientation with respect to the substrate plane were successfully grown by the evaporation method. The chemical vapor deposition method was investigated. Films are produced by this method with good uniformity and adherence to steel and other substrates that are used in the evaporation method. GRA

N74-29425# City Coll. of the City of New York. Dept. of Chemical Engineering.
COMBINED CYCLE SYSTEM STUDIES
Michael J. Gluckman Jul. 1973 16 p
(Grant NSF GI-34286)
(PB-228876/9; CCERI-102; NSF-RA/N-73-071) Avail: NTIS

HC $4.00 CSCL 10A

The report discusses the effects of air compression ration on the efficiency of combined gas and steam turbine power generating equipment. Described is a partially supercharged superheating system devised to reduce the high stack temperatures experienced from conventional exhaust fired systems when large amounts of saturated steam are introduced into the steam boiler superheating section. GRA

N74-29426# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

A RATIONAL METHOD FOR EVALUATING SOLAR POWER GENERATION CONCEPTS

George O. G. Lof and Susumu Karaki May 1973 12 p refs (Grant NSF GI-37815)

(PB-227822/4; NSF-RA/N-73-050) Avail: NTIS HC $3.00 CSCL 10A

Important elements which must be included in a technical and economic analysis of solar power generation and the rationale behind them are discussed. Collector, thermal transport, storage, and heat engine subsystems are appraised and an integrated assembly providing for least cost per unit of electrical power output for varying conditions of operation is assessed. Solar thermal electric power systems are analyzed to establish a basis for more intensive research and development efforts of specific systems. Author (GRA)

N74-29427# Delaware Univ., Newark. Inst. of Energy Conversion.

DOMESTIC SOLAR ENERGY SYSTEMS FOR DELAWARE

Virendra Mohan Puri and F. A. Costello May 1973 184 p refs

(Grant NSF GI-34872)

(PB-228039/4; NSF-RA/N-73-026) Avail: NTIS HC $5.50 CSCL 10B

The economics and performance of domestic solar energy system for Delaware is analyzed. Various performance factors, such as solar array orientation, cell temperature, atmospheric attenuation of solar radiation due to cloud cover, dust and air particle scattering, and water vapor and carbon-dioxide absorption, reflectance from different glass surfaces radiation and convection loss to atmosphere, are accounted in the analysis. Three solar energy systems were analyzed, solar electric only, solar electric only is expensive compared to current fossil-produced electricity, whereas the solar thermal/electric system is promising for the future. The solar thermal only system appears economical even with the current state of art Author (GRA)

N74-29428# Delaware Univ., Newark. Inst. of Energy Conversion.

FLAT PLATE COLLECTORS WITH CdS SOLAR CELLS AND FIRST INDICATIONS OF FEASIBILITY FOR THEIR LARGE SCALE USE

K. W. Boer, N. Freedman, H. Hadley, W. Nelson, K. Selcuk, C. E. Birchenall, J. Olson, and L. Partain 1 Jun. 1973 23 p refs

(Grant NSF GI-34872)

(PB-227958/6; NSF-RA/N-73-018; NSF-RANN/SE/GI-34872/TR-73-1) Avail: NTIS HC $3.00 CSCL 10B

Results of life testing of CdS/Cu2S solar cells indicate that life expectancies in excess of 20 years under terrestrial conditions may be possible if temperatures are limited to below 50C. Such solar cells are incorporated in flat plate collectors currently deployed on the roof of the Delaware solar house. These collectors are described together with a means to limit their operating temperature. The cells can be substantially simplified without marked loss of conversion efficiency and may be produced at a rate of 10th to the 7th power sq m/year for less than $10/sq m. Author (GRA)

N74-29429# Office of Science and Technology, Washington, D.C. Energy Advisory Panel.

AN ASSESSMENT OF NEW OPTIONS IN ENERGY RESEARCH AND DEVELOPMENT

Nov. 1973 297 p refs Sponsored in part by NSF

(PB-229725/7; AET-9) Avail: NTIS HC $6.75 CSCL 10A

The options for national energy research and development were considered. A framework was developed to intercompare the benefits of disparate R and D activities and, within that framework eleven technological areas were evaluated: resource extraction, solar energy, geothermal energy, coal utilization, advanced cycles for power generation, alternate breeder reactors, fusion, hydrogen and other synthetic fuels, electrical transmission, transportation and urban and residential energy use. R and D programs were recommended in each of these areas. GRA

N74-29430# Wisconsin Univ., Madison. Engineering Experiment Station.

MODELING OF SOLAR HEATING AND AIR CONDITIONING Semiannual Progress Report, 1 Jan. - 30 Jan. 1973

W. A. Beckman and J. A. Duffie 31 Jul. 1973 21 p refs

(Grant NSF GI-34029)

(PB-228877/7; NSF-RA/N-73-088; NSF-RANN/SE/GI-34029/PR-73-2) Avail: NTIS HC $4.00 CSCL 13A

Processes for application of solar energy to heating, cooling and service hot water supply of buildings are comprised of components which function in interrelated manner. The components include: solar energy collector, storage unit, service hot water facility, air conditioner, space heater, auxiliary energy source, associated controls and the building. In this work, the transient thermal performances of these components is mathematically modeled, the models are programmed, and the complete system is operated in particular climates using appropriate meteorological data. A first system has been modeled based on water heating collectors, water storage tanks, lithium bromide-water absorption cooler (with cooling tower) and associated equipment. It has operated on a residential type building in Albuquerque climate. The thermal analysis shows integrated energy supplied from solar and auxiliary energy through a year. Based on this thermal analysis a preliminary cost analysis is made to compare solar and conventional systems. GRA

N74-29431# Army Electronics Command, Fort Monmouth, N.J.

LOW POWER METHANOL-AIR BATTERY

John Jr. Perry Apr. 1974 24 p ref

(DA Proj. 1S7-62705-AH-94)

(AD-779183; ECOM-4213) Avail: NTIS CSCL 10/2

An increased need for low power, long life power supplies has become apparent with the development of transistorized military communications and surveillance equipments. In view of this, a set of test specifications approximating characteristic performance requirements was defined in order to establish the feasibility criteria for a low power methanol-air-battery. An energy density of 88 Wh/lb was set as a goal, at a continuous drain of 45 mW for 2,000 hours, with the capability of response to 15 W pulses for 6 seconds at 10-minute intervals. A 9-cell battery stack was fabricated in-house for test and evaluation under the 45 mW/15 W load profile. The teflon-bonded anode was catalyzed with 75% palladium/25% platinum and the cathodes catalyzed with silver. The total weight of the battery stack, activated with 655 ml of methanol-electrolyte mixture, was 5.6 lb. Performance is reported. GRA

N74-29432# Naval Ordnance Lab., White Oak, Md.

THEORETICAL SIMULATION OF THE PERFORMANCE OF MOLTEN SALT THERMAL BATTERIES Technical Report, Jun. 1971 - Jun. 1973

Alan S. Kushner Aug. 1973 29 p refs

(AD-779269; NOLTR-74-24) Avail: NTIS CSCL 10/3

A computer program for the Thermal and Electrical Analysis of Batteries (TEAB) has been developed as a tool for the computer-aided design of molten salt thermal batteries. TEAB solves the coupled set of equations describing the temperature distribution within a molten salt cell and the electrical characteristics of the cell. Heat generation due to start-up heat source, electrochemical phenomena, and the flow of electric current within the cell are all included. The program calculates the spatial and time temperature variation within the cell during start-up and during cell operation, checks for a satisfactory molten electrolyte zone for cell operation, and calculates the cell voltage-current characteristics as a function of time. TEAB has been utilized in the Li-Cl2 Battery Development Program at the Naval Ordnance Laboratory. (Modified author abstract) GRA

N74-29433# EIC, Inc., Newton, Mass.
LITHIUM - INORGANIC ELECTROLYTE BATTERIES Quarterly Report, 16 Dec. 1973 - 15 Mar. 1974
David R. Cogley and Michael J. Turchan May 1974 42 p refs
(Contract DAAB07-74-C-0030; DA Proj. 1T1-61102-A-34A)
(AD-779477; C-401-2; ECOM-0030-2-74; QR-2) Avail: NTIS CSCL 10/3

An all-inorganic electrolyte, lithium primary battery operable over the temperature range - 40 to -160F is being evaluated. The desired energy density is 150 watt-hours per pound of total battery weight and the desired power density is 50 watts per pound. Discharge characteristics of the Li/LiAlCl(4-)SOCl2/C system were obtained at -40, -72, and 160F. Chemical analysis of precipitates formed in carbon electrodes of cells discharged at ambient temperature provided information on reaction stoichiometry. For each equivalent of Li oxidized, one mole of LiCl precipitated in or on the carbon electrode. The weight gain of the carbon electrode was due solely to LiCl precipitation. No other insoluble salt was formed. There was evidence for sulfur formation on discharge at -40F. Pressures were observed when cells were discharged at 160F. They are higher than the expected SOCl2 vapor pressures, and result from gases not condensible at room temperature. (Modified author abstract)
GRA

N74-29434# Minnesota Univ., Minneapolis.
RESEARCH APPLIED TO SOLAR-THERMAL POWER SYSTEMS Semiannual Progress Report, 1 Jul. - 31 Dec. 1972
G. Betz, W. B. Bienert, E. R. G. Eckert, J. M. Hammer, and R. C. Jordan Jan. 1973 56 p refs Prepared in cooperation with Honeywell, Inc., Minneapolis, Minn.
(Grant NSF GI-34871)
(PB-231591/9; NSF-RA/N-73-066;
NSF-RANN/SE/GI-34871/PR-72-4) Avail: NTIS HC $5.75 CSCL 10B

The function of a solar-thermal power system is to supply solar-generated heat to the turbines of an electric power plant. The basic system presently being considered under this program is composed of an array of collectors (consisting of a parabolic reflector which concentrates and directs the solar radiation onto a heat pipe absorber tube in which the energy is transferred to a fluid), a transfer loop (a system of pipes which transports the energy to the power plant proper), and optionally an energy storage system to provide energy during no sunshine hours Systems being studied represent current state of technology, but should not be construed as final designs. They represent only baselines from which trade-offs and component research can be conducted.
GRA

N74-29435# Minnesota Univ., Minneapolis.
RESEARCH APPLIED TO SOLAR-THERMAL POWER SYSTEMS Semiannual Progress Report, 1 Jan. - 30 Jun. 1973
E. R. G. Eckert Jul. 1973 221 p refs Prepared in cooperation with Honeywell, Inc., Minneapolis
(Grant NSF GI-34871)
(PB-231592/7; NSF-RA-N-73-101;
NSF-RANN/SE/GI-34871/PR-73-2) Avail: NTIS HC $14.00 CSCL 10B

Research activities performed during the period from January 1, 1973 to June 30, 1973 are reported. The studies encompassed the solar concentrator the solar absorber coating, the heat pipe, the transfer loop, and heat storage containment vessels. With respect to the concentrator, analysis has provided definitive information on tracking, shadowing of adjacent collectors, concentration ratio, and concentrator dimensions. Tests were made of the life characteristics of the concentrator reflective coatings and of the absorber surface coating. Operating characteristics of candidate heat pipes have been determined both by analysis and experiments. System studies provided information on heat loss and pressure drop for steady operation of the transfer loop and for the transient behavior initiated by the absence of insolation. The corrosion of containment walls in the presence of phase-change heat storage materials was studied by depth profiling with Auger electron spectroscopy.
GRA

N74-29436# Minnesota Univ., Minneapolis.
RESEARCH APPLIED TO SOLAR-THERMAL POWER SYSTEMS Semiannual Progress Report, 1 Jul. - 31 Dec. 1973
E. M. Sparrow, J. W. Ramsey, and G. K. Wehner Jan. 1974 211 p refs Prepared in cooperation with Honeywell, Inc., Minneapolis
(Grant NSF GI-34871)
(PB-231593/5; NSF-RA-N-74-005;
NSF-RANN/SE/GI-34871/PR/73/4) Avail: NTIS HC $5.75

This report documents the research and development efforts during the period from July 1, 1973 to December 31, 1973. A scaled model of a solar collector module has been designed and fabricated. Life testing of candidate mirror coatings for the solar concentrator have continued. The performance of solar absorber coatings at various elevated temperatures has been investigated. Heat pipe tests were performed to examine the compatitibility of stainless steel and copper containment materials, with water as a working fluid. The nighttime cooling and subsequent early morning warming of the pipelines and other fluid-carrying components of the transfer loop were analyzed. Computations were performed to determine the effect of daytime variations of insolation on the heat losses and pumping energy. Steady-state operating characteristics of three transfer loop configurations were computed.
GRA

N74-29437# Tyco Labs., Inc., Waltham, Mass.
LITHIUM-NICKEL SULFIDE BATTERIES Final Report, 15 May - 14 Nov. 1973
Hari Vaidyanathan, Paul Malachesky, and Gerhard Holleck Feb. 1974 26 p refs
(Contract F19628-73-C-0271; AF Proj. 8659)
(AD-779691; AFCRL-TR-74-0081) Avail: NTIS CSCL 10/3

Studies have been carried out on the development of Ni3S2-impregnated plaque electrode structures for use as positive plates of high discharge rate capability in nonaqueous electrolyte lithium batteries. Achievement of reasonable Ni3S2 loadings in nickel plaques requires conversion of NiSO4 to Ni3S2 before each impregnation to avoid rehydration/dissolution of the nickel sulfate which apparently limits the attainable loadings. Electrochemical evaluation of Ni3S2-impregnated plaque structures in simple Li cells has shown that such positive electrode structures can be discharged at rates up to processor. (Modified author abstract)
GRA

N74-29438# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEW ELECTROCHEMICAL SOURCES OF ENERGY
V. S. Bagotskii 16 Apr. 1974 21 p refs Transl. into ENGLISH from Zh. Vses. Khim. Obshchest. (USSR), v. 16, no. 6, 1971 p 685-690
(FTD Proj. T74-04-03)
(AD-779175; FTD-HT-23-0012-74) Avail: NTIS CSCL 10/3

The translation briefly reviews the history and state of the art of electrochemical current sources, including galvanic cells, storage batteries, and fuel cells.
GRA

N74-29439# Oak Ridge National Lab., Tenn.
EFFECTS OF ELECTROMAGNETIC PULSE (EMP) ON THE SUPERVISORY CONTROL EQUIPMENT OF A POWER SYSTEM Final Report
James K. Baird and Nicholas J. Frigo Oct. 1973 137 p refs Sponsored by AEC
(AD-779268; ORNL-4899) Avail: NTIS CSCL 10/2

The study assesses the damage caused by EMP to relays and other equipment forming the supervisory control circuits of a power system. Electromechanical relays are nearly impervious to damage and false operation due to EMP. Semiconductor relays are expected to be quite sensitive to both. Countermeasures are proposed to limit damage and prevent false operation of supervisory control circuits.
Author (GRA)

N74-29440# Tennessee Univ., Knoxville. Dept. of Chemistry.
HIGH ENERGY CATHODES FOR FUSED SALT BATTERIES Final Report, 11 Dec. 1972 - 10 Mar. 1974
G. Mamantov, R. Marassi, and J. Q. Chambers Apr. 1974 35 p refs
(Contract DAAB07-73-C-0060; DA Proj. 1T0-61102-A-34A)

(AD-779385; ECOM-0060-F-73) Avail: NTIS CSCL 10/3

Several compounds have been tested as potential cathodes in batteries using low-melting molten chloroaluminate (AlCl3-NaCl mixtures) solvents and aluminum metal anodes. Fluorinated graphite with different fluorine content, binary and ternary intercalation compounds, such as C-WCl6 and C-AlCl3-Cl2, several quinones, and positive iodine and sulfur cations have been studied. The latter, involving positive oxidation state of sulfur, is the most promising cathode system of those studied (S(sub n) (m-)/Al). (Modified author abstract) GRA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-29441*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 128, MAY 1974

May 1974 85 p refs

(NASA-SP-7011(128)) Avail: NTIS HC $4.00 CSCL 06E

This special bibliography lists 282 reports, articles, and other documents introduced into the NASA scientific and technical information system in April 1974. Author

N74-29442*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 129, JUNE 1974

Jun. 1974 86 p refs

(NASA-SP-7011(129)) Avail: NTIS HC $4.00 CSCL 06E

This special bibliography lists 280 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1974. Author

N74-29443*+ National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE CONTINUING BIBLIOGRAPHY OF THE 1973 ISSUES

Jan. 1974 590 p refs

(NASA-SP-7011(124)) Avail: NTIS HC $11.00 CSCL 06E

A cumulative index to the abstracts contained in Supplements 112 through 123 of Aerospace Medicine and Biology A Continuing Bibliography is presented. It includes three indexes: subject, personal author, and corporate source. Author

N74-29444# National Environmental Research Center, Research Triangle Park, N.C. Human Studies Lab.

HEALTH CONSEQUENCES OF SULFUR OXIDES: A REPORT FROM CHESS, 1970-1971

May 1974 456 p refs

(EPA-650/1-74-004) Avail: NTIS HC $26.00

Epidemologic studies of the U.S. Environmental Protection Agency's Community Health and Environmental Surveillance System (CHESS) program provide dose-response information relating short-term and long-term pollutant exposures to adverse health effects. Results are presented of studies conducted in CHESS communities in New York and the Salt Lake Basin during 1970-1971. In addition, studies conducted in Idaho-Montana, Chicago, and Cincinnati, in which health indicators similar to those used in CHESS were employed, are included. Attention is focused on the health effects associated with sulfur oxides, but the relative contribution of various air pollutants, especially sulfur dioxide, total suspended particulates, and suspended sulfates, to observed disease frequencies is considered. Health indicators of long-term pollution effects employed in these studies included increased prevalence of chronic bronchitis in adults, increased acute lower respiratory infections in children, and increased acute respiratory illness in families. Author

N74-29445# Direction de la Meteorologie Nationale, Paris (France).

EVAPOTRANSPIRATION: AGROMETEOROLOGICAL ASPECT. PRACTICAL EVALUATION OF EVAPOTRANSPIRATION POTENTIAL [LEVAPOTRANSPIRATION: ASPECT AGROMETEOROLOGIQUE EVALUATION PRATIQUE DE LEVAPOTRANSPIRATION POTENTIELLE]

P. Brochet and N. Gerbier Mar. 1974 101 p refs In FRENCH

Avail: NTIS HC $8.25

A report was made on essential data concerning evapotranspiration, evapotranspiration potential, and the general function of water transfer between the soil, plants, and the atmosphere. The practical application of this data in agricultural regions is discussed. Formulas used to calculate the evapotranspiration potential are included. Transl. by E.H.W.

N74-29446*# Food and Drug Administration, Cincinnati, Ohio.

ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Report, 1 Oct. - 31 Dec. 1973

J. E. Campbell Feb. 1974 7 p

(NASA Order W-13411)

(NASA-CR-138895; QR-35) Avail: NTIS HC $4.00 CSCL 06M

Statistical considerations in designing sterilization experiments are discussed in terms of the basic design, pooling of runs, and process assessment. F.O.S.

N74-29447*# Techtran Corp., Glen Burnie, Md.

LIFE IN WEIGHTLESSNESS BIOLOGICAL LABORATORIES IN ORBIT

N. Zheleznov Washington NASA Jul. 1974 7 p Transl. into ENGLISH from Izv. (USSR), 1 Mar. 1974

(Contract NASw-2485)

(NASA-TT-F-15851) Avail: NTIS HC $4.00 CSCL 06S

The flight and experiments conducted aboard the cosmos-605 biosatellite are discussed. Several experiments were conducted with determination of the effect of weightlessness on various phylogenic categories of plants and animals. The experiments revealed weightlessness did not have a pathological effect on the animals, as compared with control specimens on earth, but did exert a deforming effect on fungi. Author

N74-29448*# Techtran Corp., Glen Burnie, Md.

THE SIGNIFICANCE OF CUMULATIVE CORIOLIS ACCELERATION FOR TESTS FOR EXPERT MEDICAL SELECTION

I. Ya. Yakovleva, V. P. Baranova, E. I. Matsnev, and A. Ya. Tizul Washington NASA Jul. 1974 8 p refs Transl. into ENGLISH from Vestn. Otorino-Laringol. (USSR), no. 1, Jan.-Feb. 1974 p 25-28

(Contract NASw-2485)

(NASA-TT-F-15824) Avail: NTIS HC $4.00 CSCL 06S

The results of the test for cumulation of coriolis accelerations in 376 men: 269 healthy and 107 with various somatic pathology are presented. Action tolerance was assessed by the data of clinical observations, ECG, arterial pressure, results of neuropathologist's examination and EEG. The test was tolerated excellently in 15%, well - in 14%, satisfactorily - in 20%, and poorly in 51% of cases. This test not only characterized vestibular stability, but also aided in detection of latent pathology: hypertensive reactions were revealed in 69 patients, hypertensive disease in 19, epilepsy undiagnosed before was revealed in 7 patients. Author

N74-29449# Naval Medical Field Research Lab., Camp Lejeune, N.C.

SYMPOSIUM ON HEAT STRESS AND HEAT ACCLIMATIZATION Medical Research Progress Report No. 4

Jesse F. Adams and John W. Johnson Apr. 1974 144 p refs Conf. held at Camp LeJeune, N. C., 12-13 Jun. 1973

(AD-777700) Avail: NTIS CSCL 06/19

A conference on heat stress, heat strain and heat acclimatization was convened. The conference attendees were a group of experts from the United States and abroad. The attendees were asked to discuss, on an informal basis, the physiologic and other criteria of heat stress and methods of measurement; the criteria and mechanisms of heat acclimatization and methods of

measurement; the factors that should be studied in investigating the poorly acclimatizable or super acclimatizable individual; acceptable limits of pulse rate, body temperature or other parameters for humans working in heat; relationship of laboratory diagnosis of acclimatization with performance capability in the field. In addition, each conferee was asked to contribute his suggestions on areas of research in heat stress and heat acclimatization that would appear to be most promising and have highest priorities in military needs. (Modified author abstract) GRA

N74-29450# Army Foreign Science and Technology Center, Charlottesville, Va.
MATHEMATICAL MODEL OF BEHAVIOR DEVELOPED ON THE BASIS OF THE THEORY OF SET
V. V. Chavchanidze 31 Jan. 1974 7 p refs Transl. into ENGLISH from an unidentified RUSSIAN language article
(AD-776128; FSTC-HT-23-307-72) Avail: NTIS CSCL 05/10

A mathematical description of the example of psychophenomenon of set, the making of a decision, is given. This model (a psychotrome) is a system which includes two linked automations (hierarchic) working with various alphabets and forming a closed chain of reciprocal action and adapted adjustment. The experimental discovery of dynamic transfers between set states, the bringing out of a multitude of fixed set states and the structuring of an adequate cross-automatic model is a first step in the building of a general model of behavior. Author (GRA)

N74-29451# Naval Ordnance Lab., White Oak, Md.
NUMERICAL SOLUTION OF A DIFFUSION CONSUMPTION PROBLEM WITH A FREE BOUNDARY
Alan E. Berger, Melvyn Ciment, and Joel C. W. Rogers 31 Jan. 1974 63 p refs
(AD-778309; NOLTR-74-7) Avail: NTIS CSCL 06/16

The authors consider the numerical solution of an implicit moving free boundary problem which arises in the study of diffusion and consumption of oxygen in tissue. A fixed domain numerical method is presented which is motivated by a theoretical formulation developed by Rogers. The numerical method uses any convenient finite difference or finite element scheme which converges to the underlying partial differential equation. The frontal generation appears by way of a simple algebraic comparison operation involving truncation of the computed approximation. Higher space dimensions are treated with equal ease. Results of numerical experiments are presented. A convergence proof for the truncation method is given. Author (GRA)

N74-29452*# Army Medical Lab. (361st), Chicago, Ill.
CIRCADIAN VARIATION IN PRESUMABLY HEALTHY YOUNG SOLDIERS
L. L. Kanabrocki, L. E. Scheving (Arkansas Univ., Little Rock), F. Halberg (Minnesota Univ., Minneapolis), R. L. Brewer, and T. J. Bird Feb. 1974 63 p
(Grants NGR-24-005-006; PHS-5-K6-GM-13)
(NASA-CR-139234; PB-228427/1) Avail: NTIS HC $3.75 CSCL 06P

A group of thirteen young soldiers was standardized for approximately thirty hours with rest time. Each man was sampled at three-hour intervals throughout one 24-hour period; this involved the measurement of oral temperature, radial pulse, blood pressure, intraocular pressure and minute ventilation. One year later another study was performed similarly on twelve men over a 72-hour period. A great majority of the many variables analyzed demonstrated a significant fit to a 24 hour cosine curve. From this same analysis, one was able to estimate three rhythmic parameters and their confidence limits; these included the acrophase (crest of best-fitting cosine), the amplitude and the mesor (computer-determined overall mean). The significance of these data is discussed. (Modified author abstract) GRA

N74-29453# George Washington Univ., Washington, D.C. Dept. of Science Communication.
OXYGEN TOXICITY
T. C. Schmidt and R. W. Hamilton, Jr. 21 Dec. 1973 50 p refs Prepared in part by Ocean Systems, Inc., Tarrytown, N. Y.
(Contract N00014-67-A-0214-0013)
(AD-779282; CRL-T-743) Avail: NTIS CSCL 06/20

Prolonged exposure to increased partial pressure of oxygen can result in toxic effects which become progressively more severe as the inspired partial pressure and/or duration of exposure is increased. The most dramatic of these are toxic effects upon the respiratory system (The Lorraine-Smith Effect) and upon the central nervous system (The Paul Bert Effect); as well as other toxic effects upon the body including destruction of red blood cells and the neurosensory tissues of the eye. Commonly recognized forms of oxygen toxicity are illustrated. GRA

N74-29454# Texas Univ., Austin. Applied Research Labs.
A COLLECTION OF TRANSLATIONS OF FOREIGN LANGUAGE PAPERS ON THE SUBJECT OF BIOLOGICAL SONAR SYSTEMS
K. Jerome Diercks Feb. 1974 274 p refs
(Contract N00123-73-C-0575)
(AD-778691; ARL-TR-74-9) Avail: NTIS CSCL 06/4

Contents: Research on the nervous echolocation mechanism in bats; Interaction of analyzers in dolphins during discrimination of geometrical figures under water; The location signals of bats native to the U.S.S.R.; The relationship between auditory perception and echolocation during hunting in Myotis oxygnathus; Types and formularies of experiments to be carried out in order to obtain comparative results; Mechanisms of overcoming interference in echolocating animals; Main directions in the evolution of locational systems in bats. GRA

N74-29455# Frankford Arsenal, Philadelphia, Pa.
THE HISTOPATHOLOGY OF CHORIORETINAL LESIONS PRODUCED BY THE GALLIUM ARSENIDE LASER
Dolph O. Adams, D. J. Lund, and Paul D. Shawaluk Oct. 1973 26 p refs
(DA Proj. 1T0-61102-A-31C; DA Proj. 3A0-6211-0-A-821)
(AD-778736; FA-M73-31-1) Avail: NTIS CSCL 06/18

The histopathology of chorioretinal lesions in the rhesus monkey produced by the gallium arsenide laser is discussed. The present studies do confirm previous ophthalmoscopic observation that round lesions are produced by the oval beam of the gallium arsenide laser. Healing of the lesions induced by the gallium arsenide laser is also discussed. Evidence of significant chorioretinal welding, fibrosis, or gliosis was not found. Author (GRA)

N74-29456# George Washington Univ., Washington, D.C. Dept. of Science Communication.
BREATHING MIXTURES
R. W. Hamilton, Jr. 29 Dec. 1973 93 p refs Prepared in cooperation with Ocean Systems, Inc., Tarrytown, N. Y.
(Contract N00014-67-A-0214-0013)
(AD-779302; CRL-T-750) Avail: NTIS CSCL 06/19

The report is concerned with the elements involved in the choice of breathing mixtures for diving. Two aspects are obligatory from the beginning, a diver's breathing gas must be supplied under pressure approximately equal to that of the divers' lungs, and all mixtures must contain oxygen. Beyond this the tradeoffs begin, and the ideal choice of gas is a compromise of several factors. These factors, oxygen toxicity, metabolism, inert gas narcosis, high pressure nervous syndrome, density, voice, thermal properties, decompression, fire safety, cost and logistics -- are covered. Current diving modes require the selection of optimal breathing mixtures for each of several operational situations. These include scuba, closed and semi-closed breathing rigs, hose-supplied gas, and the atmosphere of both submerisible and deck chambers; in addition to the equipment used, the particular diving situation affects the choice of gas. GRA

N74-29457# Freie Univ., Berlin (West Germany). Physiologisches Inst.
VOLUME CONDITIONED STIMULI AFFECTING SALT AND WATER EXCRETION Interim Scientific Report, 1 Jul. 1971 - 30 Nov. 1973
O. H. Gauer, K. Kirsch, and L. Lange 30 Jan. 1974 10 p refs
(Contract F44620-71-C-0117; AF Proj. 9777)
(AD-779781; AFOSR-74-0753TR) Avail: NTIS CSCL 06/19

The following investigations were conducted to analyze certain aspects of plasma volume control and simulated weightlessness by whole body immersion in a thermo-indifferent bath. Upon immersion the central venous pressure rises to about 15 mmHg.

Rontgenometric studies reveal an increase of heart volume by 20 ml, when a standing subject was immersed. The effective compliance of the circulation of man was determined together with the compliance of the intrathoracic vascular compartment. The former is 2 - 3 ml/mmHg/kg, the latter 0.9 - 1.2 ml/mmHg/kg. Using radio-isotope techniques the redistribution of the extracellular fluid volume between interstitial fluid volume and plasma volume was investigated together with central venous pressure under various states of hydration. (Modified author abstract) GRA

N74-29458# Yale Univ., New Haven, Conn. Dept. of Biology.
MATHEMATICAL MODELS AND ELECTROPHYSIOLOGICAL STUDIES OF ECHOLOCATION Annual Report
Alvin Novick Feb. 1974 7 p refs
(Grant AF-AFOSR-2201-71; AF Proj. 9777)
(AD-779047; AFOSR-74-0751TR) Avail: NTIS CSCL 06/3

Studies of cochlear microphonic potentials during landing maneuvers were conducted with special focus on the degree of Doppler shift encountered in real flights and the exact placement of output frequencies and Doppler shifted echoes in reference to the bats sharply tuned ears. Data analyses are currently in progress. Theoretical analysis of bat sonars, in reference to CF as opposed to FM bats is continuing with publication of a paper on a model of wideband echolocation. Eight nerve audiograms were conducted with the aid of chronically implanted electrodes. The audiograms proved to be greatly different from the cochlear microphonic audiogram in the same bats. The on and the off audiograms both showed tuning to the fundamental, second harmonic and third harmonic of the sonar pulses as well as to the elements of the FM sweeps and their harmonics but the tuning of the two curves is reciprocal. (Modified author abstract) GRA

N74-29799* Kanner (Leo) Associates, Redwood City, Calif.
CONSTRUCTION OF A MATHEMATICAL MODEL OF THE HUMAN BODY, TAKING THE NONLINEAR RIGIDITY OF THE SPINE INTO ACCOUNT
K. K. Glukharev, N. I. Morozova, B. A. Potemkin, V. S. Solovyev, and K. V. Frolov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 38-40 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 37-38 (For availability see N74-29785 19-15)
CSCL 06P

N74-29914* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROLE OF GRAVITY IN PREPARATIVE ELECTROPHORESIS
M. Bier (Arizona Univ., Tucson), J. O. N. Hinckley (Arizona Univ., Tucson), A. J. K. Smolka (Arizona Univ., Tucson), M. J. Binder (Arizona Univ., Tucson), M. Coxon (Arizona Univ., Tucson), T. W. Nee (Arizona Univ., Tucson), M. O. Scully (Arizona Univ., Tucson), H. S. T. Shih (Arizona Univ., Tucson), and R. S. Snyder *In its* Proc. of the 3d Space Processing Symp. on Skylab Results. Vol. 2 Jun. 1974 p 729-253 refs (For availability see N74-29905 19-15)
CSCL 06C

N74-29915* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PREPARATIVE ELECTROPHORESIS OF LIVING LYMPHOCYTES
C. J. VanOss (State Univ. of New York, Buffalo), P. E. Bigazzi (State Univ. of New York, Buffalo), C. F. Gillman (State Univ. of New York, Buffalo), and R. E. Allen *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 755-762 refs (For availability see N74-29905 19-15)
(Contract NAS8-29745)
CSCL 06C

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-29459*# Essex Corp., Alexandria, Va.
MANIPULATOR SYSTEM MAN-MACHINE INTERFACE EVALUATION PROGRAM
Thomas B. Malone, Mark Kirkpatrick, and Nicholas L. Shields Jan. 1974 102 p
(Contract NAS8-28298)
(NASA-CR-120218; H-4-3) Avail: NTIS HC $8.25 CSCL 05H

Application and requirements for remote manipulator systems for future space missions were investigated. A manipulator evaluation program was established to study the effects of various systems parameters on operator performance of tasks necessary for remotely manned missions. The program and laboratory facilities are described. Evaluation criteria and philosophy are discussed. E.J.O.

N74-29460*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
RIDE QUALITY EVALUATION 1: QUESTIONNAIRE STUDIES OF AIRLINE PASSENGER COMFORT
Larry G. Richards and Ira D. Jacobson Jul. 1974 58 p refs
(Grant NGR-47-005-181)
(NASA-CR-139368; Memo-403214) Avail: NTIS HC $6.00 CSCL 05E

As part of a larger effort to assess passenger comfort in aircraft, two questionnaires were administered: one to ground-based respondents; the other to passengers in flight. Respondents indicated the importance of various factors influencing their satisfaction with a trip, the perceived importance of various physical factors in determining their level of comfort, and the ease of time spent performing activities in flight. The in-flight sample also provided a rating of their level of comfort and of their willingness to fly again. Comfort ratings were examined in relation to (1) type of respondent, (2) type of aircraft, (3) characteristics of the passengers, (4) ease of performing activities, and (5) willingness to fly again. Author

N74-29461*# Methodist Hospital, Houston, Tex.
FABRICATION OF NEUROPHYSIOLOGICAL MONITORING SYSTEMS Final Report
James D. Frost, Jr. Washington NASA Jun. 1974 69 p
(Contract NAS9-13065)
(NASA-CR-2416) Avail: NTIS HC $3.75 CSCL 06B

A system designed to collect electroencephalographic, electro-oculographic, electromyographic, and head motion data is described. The portable instrumentation provides a rapid and simple means by which neurophysiological data can be obtained by the patient in his home and the taped data returned to the laboratory for analysis. The system was designed primarily for the study of sleep. Author

N74-29462*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A DESCRIPTION OF MODEL 3B OF THE MULTIPURPOSE VENTRICULAR ACTUATING SYSTEM
John A. Webb, Jr. Jun. 1974 48 p refs
(NASA-TM-X-71570; E-8009) Avail: NTIS HC $3.25 CSCL 06L

The multipurpose ventricular actuating system is a pneumatic signal generating device that provides controlled driving pressures for actuating pulsatile blood pumps. Overall system capabilities, the timing circuitry, and calibration instruction are included. Author

N74-29463*# Case Western Reserve Univ., Cleveland, Ohio. Engineering Desing Center.
MICROELECTRONIC BIOINSTRUMENTATION SYSTEM Annual Progress Report, Sep. 1973 - Aug. 1974
Wen H. Ko, Eugene T. Yon, and Ralph J. Rodriguez 27 Jul. 1974 59 p

(Grant NGR-36-027-053)
(NASA-CR-139216) Avail: NTIS HC $6.00 CSCL 06B

The progess made from April 1973 to June 1974 on a microelectronics bioinstrumentation system is reported and includes data for the following three individual projects: (1) a radio frequency powered implant telemetry system; (2) an ingestible temperature telemeter; and (3) development of pO2 and pH sensors. Proposed activities for continuation of the research for the period September 1, 1974 to August 31, 1975 are also discussed. A.A.D.

N74-29464*# Kanner (Leo) Associates, Redwood City, Calif.
FIELD OF VISION AND SIMPLE REACTION TIME DURING RECREATION EXERCISES AT WORK
T. Mieczkowski and S. Rotenberg Washington NASA Jul. 1974 13 p refs Transl. into ENGLISH from Wychowanie Fizyczne Sport (Poland), v. 9, no. 4, 1965 p 413-418
(Contract NASw-2481)
(NASA-TT-F-15828) Avail: NTIS HC $4.00

Measurements were made of the simple reaction time to sound and light stimuli and of the field of vision with respect to different colors in female telephone exchange operators performing and not performing recreation exercises during break periods. After 5 months, the simple reaction to both stimuli turned out to be shorter in the exercising group than in the control group. The loss in the field of vision with respect to the test colors was also smaller in the exercising group. The practice of recreation exercises increased the efficiency of the nerve centers and of the sight analyzer in the cerebral cortex. Author

N74-29465# Civil Aeromedical Inst., Oklahoma City, Okla.
PHYSIOLOGICAL RESPONSES IN AIR TRAFFIC CONTROL PERSONNEL: HOUSTON INTERCONTINENTAL TOWER
C. E. Melton, J. M. McKenzie, B. David Polis, Marlene Hoffman, and J. T. Saldivar, Jr. Dec. 1973 22 p refs Prepared in cooperation with Naval Air Development Center, Warminster, Pa.
(AD-777838; FAA-AM-73-21) Avail: NTIS CSCL 06/19

Biochemical and physiological indices of stress showed that the level of stress of 16 air traffic controllers at the Houston Intercontinental Airport Tower was indistinguishable from that of control populations. While the level of stress was lower than that among O'Hare Tower controllers, both groups showed about the same degree of adaptation. Day work (heavy traffic load) at Houston was characterized by elevated levels of all stress indicators as compared with the mid-shift (light traffic); epinephrine excretion increased significantly during the last half of the mid-shift as compared with the first half. Urinary stress indicators (17-ketogenic steroids, epinephrine, norepinephrine) were all significantly elevated during day sleep as compared with night sleep, indicating less effective rest during day sleep. (Modified author abstract) GRA

N74-29466# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.
PERFORMANCE, RECOVERY AND MAN-MACHINE EFFECTIVENESS Final Report, 1 Sep. 1968 - 31 Nov. 1973
Clay E. George and Richard A. Dudek Apr. 1974 73 p refs (Contract DAA005-69-C-0102; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-777797; HEL-TM-9-74) Avail: NTIS CSCL 05/5

Five years of research directed to the problem of continuous operations are summarized. Performance changes were studied in vibrating and heated environments, under varying organizational structures and for different work-rest schedules. Physiological response was studied for various work periods, work-rest schedules, heat levels and organizational roles. Results indicate that healthy young men can work safely and effectively for extensive periods of time given certain conditions. The necessary conditions include adequate nutritional intake, change of pace activities and at least brief periods of intermittent rest.
Author (GRA)

N74-29467# Air Force Human Resources Lab., Brooks AFB, Tex.
FEASIBILITY OF USING SPECIAL MEASURES IN THE CLASSIFICATION AND ASSIGNMENT OF LOWER MENTAL ABILITY AIRMEN
James M. Wilbourn and Nancy Guinn Nov. 1973 22 p refs (AF Proj. 7719)
(AD-777831; AFHRL-TR-73-31) Avail: NTIS CSCL 05/9

A battery of eleven non-verbal tests were administered. The number of significant relationships between certain non-verbal tests and final technical school grade varied as a function of mental category and career field. On cross-validation the number of significant relationships between the non-verbal composite and final school grade were reduced to four total group courses and one lower ability group course. When added to the selector Aptitude Index (AI), the non-verbal tests made a significant and unique contribution to the prediction of technical school success over and beyond the selector AI alone. Results indicate that the use of non-verbal tests as well as other aptitudinal and educational data could make a significant contribution if added to the operational selection and classification battery. (Modified author abstract) GRA

N74-29468# Frankford Arsenal, Philadelphia, Pa.
EVALUATION OF AIR FORCE LASER PROTECTIVE DEVICES
Alan H. Blumenthal and James J. Mikula Nov. 1973 51 p refs
(AD-779522; FA-R-2098) Avail: NTIS CSCL 06/17

Different types of experimental Air Force laser absorbers were evaluated as eye protective devices against laser radiation. They consisted of a light green neodymium specific Polymethyl Methacrylate (PMMA) visor, dark blue ruby-specific PMMA visor, light orange argon ion-specific PMMA visor, light blue anti-red PMMA visor, dark orange multilaser PMMA visor for protection against ruby and HeNe, dark orange multilaser PMMA visor for protection against UV, argon ion, frequency doubled Nd, GaAs and neodymium, multilaser spectacle goggles made of cellulose propionate, broadband IR-protection PMMA plates, and broadband IR protection CP goggle lenses. Results of optical density measurements at conventional low light levels and Q-switch laser powers are compared for bleaching and maintenance of desired attenuation. (Modified author abstract) GRA

N74-29469# Human Engineering Labs., Aberdeen Proving Ground, Md.
SUMMARY OF THE HUMAN ENGINEERING LABORATORY'S AIR-TO-GROUND TARGET DETECTION STUDIES USING STATIONARY TARGETS Final Technical Note
Mar. 1974 12 p refs
(AD-779409; HEL-TN-5-74) Avail: NTIS CSCL 05/5

Recent events have increased interest in the ranges at which the helicopter crewman can be expected to detect and/or identify a target. Studies of air-to-ground target detection identification have all concluded with essentially the same results; a stationary, passive, noncamouflaged military ordnance type of target can be detected by an observer in a slow speed, 60 knots, low flying, less than 300 feet, helicopter at maximum ranges up to 2000 meters but cannot be reliably identified at ranges greater than 1000 meters. GRA

N74-29470# Frankford Arsenal, Philadelphia, Pa.
THE USE OF DYNAMIC FILTERING AS A MEANS OF LASER EYE PROTECTION
Alan H. Blumenthal, Robert W. Anderson, Jr., and James J. Mikula Dec. 1973 18 p
(DA Proj. 1J6-62713-D-40)
(AD-779555; FA-R-3000) Avail: NTIS CSCL 06/17

With the growing uses and new developments in the field of laser radiation it has become increasingly vital to perfect an eye protection device for the safety of industrial workers and combat troops. An ideal dynamic filter has high visible transmittance at ordinary light levels and high optical density at increased laser powers. This is accomplished with a three level system. Absorption of laser radiation would populate an excited singlet state. If the decay to the ground state is slow and a higher excited singlet, of the proper energy separation, exists with a sufficiently large extinction coefficient, then dynamic filtering will take place. Heptaphene, phthalocyanine aluminum chloride, Sudanblack B, and Indanthrone have shown an increase in optical density over that of the ground state when subjected to a Q-switched laser. (Modified author abstract) GRA

N74-29471# Life Sciences, Inc., Hurst, Tex.
AN EXPERIMENTAL INVESTIGATION OF THE ROLE OF MOTION IN GROUND-BASED TRAINERS Final Report, Dec. 1970 - Jun. 1973
W. G. Matheny, A. L. Lowes, and J. A. Bynum Apr. 1974 67 p refs
(Contract N61339-71-C-0075)
(AD-778665; NAVTRAEQUIPC-71-C-0075-1) Avail: NTIS CSCL 05/9

The experience of users of motion simulators for training has lead to the conclusion that motion is beneficial to transfer of training. However, there is need for data relevant to the question, how much motion should be used. The purpose of the study was to provide data relevant to the specification of motion requirements for ground-based trainers for aircraft pilots. The study investigated three categories of motion: no motion, motion correlated with the output of the aircraft equations and visual displays, and random uncorrelated motion. Both man-machine system output measures, and operator output measures were used as measures of performance in studying the effects of the experimental conditions. (Modified author abstract) GRA

N74-29811* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF A DIGITAL COMPUTER FOR INVESTIGATION OF THE DYNAMIC CHARACTERISTICS OF A MAN WHILE PRESSING VERTICALLY DOWNWARD WITH THE STRAIGHT ARM ON THE HANDLE OF A VIBRATOR (INSTRUMENT)
A. I. Zazhivikhina, G. S. Rosin, and Ye. I. Ryzhov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 83-86 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 78-81 (For availability see N74-29785 19-15) CSCL 05E

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-29472# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
EVALUATION OF SOME SOLID OXIDES AS SORBENTS OF SULFUR DIOXIDE
James H. Russell, Jack I. Paige, and Danton L. Paulson 1971 30 p refs
(BM-RI-7582) Avail: NTIS HC $4.50

Several solid sorbents were investigated for their effectiveness in removing sulfur dioxide from flue gases. The materials were tested for the rate of sorption and capacity at about 300 C, and rate of regeneration around 700 C in thin beds and in 4-inch-diameter fluidized beds. Rates of material loss were also estimated. The sorbents tested included three samples of alkalized alumina, two samples of sodium carbonate-impregnated alumina, and one proprietary sample of porous silica impregnated with copper and iron compounds. The results showed that all the alkalized alumina had good sorption capacities and rates, required high temperature regeneration, and suffered excessive material loss; the sodium carbonate-impregnated alumina (1) had high sorption rates but barely adequate capacities, (2) required high temperature regeneration, and (3) suffered excessive material losses; and the copper-iron impregnated silica suffered only slight material loss and could be regenerated at a relatively low temperature, but the sorption rate and capacity were too small. Author

N74-29473# Technischen Universitaet, Hanover (West Germany).
POLYMERIZATION KINETICS OF STYRENE UNDER HIGH PRESSURE Ph.D. Thesis [ZUR KINETIK DER POLYMERISATION VON STYROL UNTER HOHEM DRUCK]
Adolf Helms 1972 143 p refs In GERMAN
Avail: NTIS HC $10.25

The effects of high pressure on the polymerization of styrene in toluene were observed by measuring viscosities during thermal chain reactions at various stages. Results show that high pressure increased reaction velocity and intermediate degree of polimerization for radical as well as thermal initiated polymerization methods. Viscosity affected the break-up velocity in thermal polymerization through diffusion control; DTBP-initiated polymerization was practically not affected by viscosity since DTBP decay does not respond to applied pressure. Transl. by G.G.

N74-29474# Technischen Universitaet, Hanover (West Germany).
STUDY OF THE REACTION BETWEEN METHANE AND FLUORINE IN SUPERSONIC FREE JETS Ph.D. Thesis [UNTERSUCHUNG DER REAKTION ZWISCHEN METHAN UND FLUOR IN UEBERSCHALLFREISTRAHLEN]
Heinz-Juergen Diesner 1973 92 p refs In GERMAN
Avail: NTIS HC $7.75

A reactor was developed for studying methane fluorination in the supersonic region. Observed were exothermic exhange reactions between the coaxial injected gas jets and gas dynamic processes and chemical reactions in the combustion flame zone. Transl. by G.G.

N74-29475*# California Univ., Berkeley. Space Sciences Lab.
ANALYTICAL TECHNIQUES FOR IDENTIFICATION AND STUDY OF ORGANIC MATTER IN RETURNED LUNAR SAMPLES Final Report, 1 Jun. 1966 - 31 May 1968
A. L. Burlingame 15 Mar. 1974 186 p refs
(Grant NGR-05-003-134)
(NASA-CR-139367; SSL-Ser-15-Issue-15) Avail: NTIS HC $12.50 CSCL 07D

The results of geochemical research are reviewed. Emphasis is placed on the contribution of mass spectrometric data to the solution of specific structural problems. Information on the mass spectrometric behavior of compounds of geochemical interest is reviewed and currently available techniques of particular importance to geochemistry, such as gas chromatograph-mass spectrometer coupling, modern sample introduction methods, and computer application in high resolution mass spectrometry, receive particular attention. Author

N74-29476*# North Dakota State Univ., Fargo. Dept. of Polymers and Coatings.
QUANTITATION OF BURIED CONTAMINATION BY USE OF SOLVENTS Semiannual Progress Report, Jul. - Dec. 1973
S. Peter Pappas, Yu-Chuan Hsiao, and Loren W. Hill Dec. 1973 14 p refs
(Grant NGR-35-001-012)
(NASA-CR-139383) Avail: NTIS HC $4.00 CSCL 07D

Spore recovery form cured silicone potting compounds using amine solvents to degrade the cured polymers was investigated. A complete list of solvents and a description of the effect of each on two different silicone polymers is provided. Author

N74-29477*# North Dakota State Univ., Fargo. Dept. of Polymers and Coatings.
QUANTITATION OF BURIED CONTAMINATION BY USE OF SOLVENTS Semiannual Progress Report, Jan. - Jun. 1974
S. Peter Pappas, Yu-Chuan Hsiao, and Lorne W. Hill Jun. 1974 9 p refs
(Grant NGR-35-001-012)
(NASA-CR-139381) Avail: NTIS HC $4.00 CSCL 07D

Experiments directed at determining the potential of reclaimed silicone polymers for reuse are described. Author

N74-29478*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN IMPLICIT SEMIANALYTIC NUMERICAL METHOD FOR THE SOLUTION OF NONEQUILIBRIUM CHEMISTRY PROBLEMS
R. A. Graves, Jr., P. A. Gnoffo, and R. E. Boughner Jul. 1974 19 p refs
(NASA-TM-X-71985) Avail: NTIS HC $3.00 CSCL 07D

The first order differential equation form systems of equations. They are solved by a simple and relatively accurate implicit semianalytic technique which is derived from a quadrature solution

of the governing equation. This method is mathematically simpler than most implicit methods and has the exponential nature of the problem embedded in the solution. Author

N74-29479*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ETHER-LINKED ARYL TETRACARBOXYLIC DIANHYDRIDES Patent Application
James A. Webster, inventor (to NASA) (Monsanto Res. Corp., Dayton, Ohio) Issued 16 Jul. 1974 17 p Sponsored by NASA
(NASA-Case-MFS-22356-1; US-Patent-Appl-SN-489008) Avail: NTIS HC $4.00 CSCL 07C

Dianhydrides were found which when reacted with diamines provide polyimides that exhibit good tensile strength, and excellent thermal, oxidative, and hydrolytic stability. These characteristics make the polyimides useful as sealants in advanced aerospace structures. A formula for the dianhydrides is given and a method for their preparation is presented. NASA

N74-29480*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
POLYIMIDES OF ETHER-LINKED ARYL TETRACARBOXYLIC DIANHYDRIDES Patent Application
James A. Webster, inventor (to NASA) (Monsanto Res. Corp.) Issued 11 Jul. 1974 19 p Sponsored by NASA
(NASA-Case-MFS-22355; US-Patent-Appl-SN-487852) Avail: NTIS HC $4.00 CSCL 07C

Polyimides with chemical and physical properties that make them useful as sealants in advanced aerospace structures and a procedure for their preparation are presented. The polyimides also have high levels of thermal, oxidative, and hydrolytic stability. NASA

N74-29481*# TRW Systems Group, Redondo Beach, Calif.
COMPATIBILITY TESTING OF SPACECRAFT MATERIALS AND SPACE-STORABLE LIQUID PROPELLANTS Final Report Addendum
L. L. Constantino, J. R. Denson, C. S. Krishnan, and A. Toy May 1974 144 p Prepared for JPL
(Contracts NAS7-100; JPL-953486)
(NASA-CR-139281; TRW-23162-6023-RU-00) Avail: NTIS HC $10.25 CSCL 07D

Compatibility measurements were made for aluminum 2219-T87 alloy and titanium 6Al-4V alloy in the presence of liquid fluorine and flox. Results of post test characterization after exposure durations of 61 and 70 weeks are presented. Results of the total test program are analyzed. E.J.O.

N74-29482# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
LIQUID DENSITIES OF OXYGEN, NITROGEN, ARGON AND PARAHYDROGEN (METRIC SUPPLEMENT)
H. M. Roder Jun. 1974 114 p refs Revised
(NBS-TN-361-Rev) Avail: NTIS MF $1.45; SOD HC $1.25 as C13.46:361

Tables of pressure, volume, density and temperature for the saturated liquid and for compressed liquid states from the triple point to the critical point, of oxygen, nitrogen, argon, and parahydrogen are presented. The table entries of temperature are in Kelvin and degrees Celsius, table ertries in pressure are in bars and kp/sq cm. Volumes or densities are given in several different units, and density ratios are tabulated for each entry. Estimates of the uncertainty for the tabulated data are given. Author

N74-29483# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE EFFECT OF SOLUTION STRUCTURE ON ION CONDUCTIVITY AND MOBILITY
Ronald A. Sasse Mar. 1974 28 p refs
(AD-777785; BRL-1705) Avail: NTIS CSCL 07/4

Xenon alters the normal structure of water by forming the xenon-clathrate. The conductivities of pure water and some aqueous solutions were measured at increasing xenon pressures to determine if increasing the degree of water structure affected the mobility of charge propagated species. No such enhancement was found and, in fact, a small decrease was noted. In both pure water and in HCl solutions xenon affected the measured conductivity and a non-reversible pathway was observed with changes in xenon pressure. The conductivity of CsBr solutions was reversible with changes in xenon pressure and the effect is described as a competition for water between the xenon clathrate and hydration sphere of the ions. Author (GRA)

N74-29484# Air Force Weapons Lab., Kirtland AFB, N.Mex.
BIODEGRADABILITY INVESTIGATION OF A NONPHENOLIC AIRCRAFT PAINT STRIPPER Final Report, Mar. - Dec. 1973
Ronald H. Kroop and Richard L. Jambor May 1974 31 p
(AF Proj. 683M)
(AD-779752; AFWL-TR-74-19) Avail: NTIS CSCL 13/2

Paint stripping of aircraft and ground equipment is conducted periodically for the prevention of intergranular corrosion of the metallic surfaces. Wastewater occurs when the viscous paint stripper is rinsed from the aircraft or ground equipment surface with a high-pressure water system. The necessity and cost of on-site treatment of phenolic aircraft paint stripping wastewater have generated an urgent need to develop a nonphenolic paint stripper that is effective for removing polyurethane and epoxy paint. A nonphenolic paint stripper (for example, Turco 5873) is effective in removing at least some polyurethane and epoxy paints. Thus, a study was made by the Air Force Weapons Laboratory (AFWL) to determine if existing biological treatment processes were effective in treating the resulting nonphenolic paint stripping wastewater. The results of laboratory-scale investigations indicate that biological treatment processes are satisfactory if (1) the methylene chloride concentration is previously reduced and, (2) the chemical oxygen demand contribution from the paint stripper does not exceed 200 mg/l. Author (GRA)

N74-29485# Panametrics, Inc., Waltham, Mass.
EXPERIMENTAL DETERMINATION OF GAS PROPERTIES AT HIGH TEMPERATURES AND/OR PRESSURES Final Report, Sep. 1971 - Oct. 1973
C. Carey, James Bradshaw, E. Lin, and E. H. Carnevale May 1974 139 p refs
(Contract F40600-72-C-0006; AF Proj. 7065)
(AD-779772; AEDC-TR-74-33) Avail: NTIS CSCL 07/4

A new technique for the accurate (1-0.01%) determination of transport and thermodynamic properties of gases is described. This technique consists of measuring the linewidth of a small acoustic resonator. The linewidth of more than one type of resonance allows the transport properties (thermal conductivity and viscosity) to be determined independently. The center frequency gives the sound speed. The theory of the acoustic resonator is presented including the effects of relaxation in the gas, slip and accommodation on the cavity walls, and acoustic transmission into the walls. The contributions of transducer coupling and feedthrough are also included in the cavity theory. Realization of cavities and transducers suitable (but not optimized) for measurements at temperatures up to 1000 K and pressures up to 500 atm are discussed. Measurements employing the resonator technique are presented in Ar, N2, air and H2. High pressure measurements (p - 460 atm) span temperatures between 300 and 600K. Measurements at 1 atm at temperatures up to 1000K are also presented. (Modified author abstract) GRA

N74-29486# Ohio State Univ., Columbus. ElectroScience Lab.
MEASURED N2O-N2 ABSORPTION AT FIVE DF LASER FREQUENCIES Quarterly Report
F. S. Mills and R. K. Long Mar. 1974 35 p refs
(Contract F30602-72-C-0016; AF Proj. 1279)
(AD-778949; ESL-3271-9; RADC-TR-74-89; QR-9) Avail: NTIS CSCL 07/4

The report presents measurements of the absorption coefficients of N2O-N2 samples at five DF laser wavelengths. A small grating-tunable pulsed DF laser was used in conjunction with a multi-traversal absorption cell having a path length for these experiments of 0.732 km. The results are compared with previously available experimental results and with calculated values. (Modified author abstract) GRA

N74-29487# Bureau of Mines, Laramie, Wyo. Energy Research Center.
SOME EFFECTS OF PRESSURE ON THE HYDROCRACKING OF CRUDE SHALE OIL COBALT MOLYBDATE CATALYST
C. M. Frost and P. L. Cottingham Jan. 1974 16 p refs
(PB-229482/5; BM-RI-7835) Avail: NTIS HC $3.00 CSCL 21D

Crude shale oil produced by gas-combustion retorting of Green River oil shale was hydrocracked over a cobalt molybdate catalyst at operating pressures of 500, 1,000, 1,500, and 3,000 psig, an operating temperature of 890F, and a liquid hourly space velocity of 1.0. Hydrogen feed rate was maintained at 6,000 scf/bbl. The volume-percent yields of total liquid product were directly proportional to the operating pressure. Weight-percent conversion and volume-percent yields of gasoline were directly proportional to the log of the operating pressure. Catalyst deposit percentages were inversely proportional to the log of the operating pressure. Nitrogen and sulfur removal rates as well as saturation of the liquid products increased as the operating pressure was increased. Author (GRA)

N74-29488# Boeing Commercial Airplane Co., Seattle, Wash.
REGENERATION OF CHROMATED ALUMINUM DEOXIDIZERS, PHASE 1 REPORT
Harry C. Hicks and Robert A. Jarmuth Dec. 1973 161 p
(PB-231835/0; EPA-660/2-73-023) Avail: NTIS MF $1.45; SOD HC $1.95 as Ep1.23:660/2-73-023 CSCL 07A

In the metal finishing industry highly concentrated hexavalent chromium solutions are used extensively to deoxidize aluminum surfaces prior to anodizing, conversion coatings, prepaint preparation welding and adhesive bonding. A regeneration process was conceived and tested to reduce the frequency of discarding the spent chromated deoxidizers. The engineering techniques developed in this project involve reoxidation of trivalent chromium to the hexavalent state by electrolysis thru a diaphragm plus removal of undesirable dissolved metals by crystallization and separation. Results of the accomplished work establish that regeneration of chromated aluminum deoxidizers is feasible, practical and economical. GRA

N74-29489# Ohio State Univ. Research Foundation, Columbus.
ELECTRON BEAM ANALYSIS OF THE PROPERTIES OF MOLECULAR NITROGEN AND NITRIC OXIDE IN THE AFFDL 2-FOOT ELECTROGASDYNAMICS FACILITY Final Report, 1 Dec. 1971 - 22 Aug. 1973
S. L. Petrie and J. J. Komar Feb. 1974 66 p refs
(Contract F33615-72-C-1023; AF Proj. 1426)
(AD-779087; AFFDL-TR-74-8) Avail: NTIS CSCL 07/4

The electron beam fluorescence technique was used to measure the vibrational temperature and number density of molecular nitrogen and nitric oxide at the exit of the 7-inch conical nozzle of the Air Force Flight Dynamics Laboratory 2-Foot Electrogasdynamics Facility. In addition, the vibrational temperature and species concentration of nitric oxide were measured at the exit of the 19-inch conical nozzle. Theoretical results assuming finite-rate chemical nonequilibrium were compared with the experimental data. The excitation-emission mechanisms for electron beam excitation of the NO gamma system in No-air and NO-nitrogen mixtures were investigated and it is shown that the excitation is dominated by secondary electrons resulting from beam-induced ionization of molecular nitrogen. Reasons for the discrepancies between the theoretical and experimental results were examined. (Modified author abstract) GRA

N74-29490# Battelle Columbus Labs., Ohio.
CHEMILUMINESCENCE FOR THE DETERMINATION OF THE KINETICS AND MECHANISM OF JET FUEL OXIDATIVE DEGRADATION Final Report, 28 Mar. 1973 - 27 Mar. 1974
Richard A. Nathan Mar. 1974 112 p refs
(Contract N00019-73-C-0360)
(AD-779335) Avail: NTIS CSCL 07/4

Dodecane, a model hydrocarbon for jet fuels, and five other hydrocarbons, tetralin, 1-tridecene, cis-and trans-decalin, and indane were subjected to chemiluminescence analysis during their oxidation. Studies were carried out on both the pure compounds and on each as a 5% additive in dodecane. Activation energies were obtained for initiation and propagation steps of the oxidation process, which were previously unavailable and contribute toward a better understanding of the oxidation mechanism. In particular, the chemiluminescence analysis identified the importance of a unimolecular propagation process prevalent during the high temperature oxidation of dodecane, 1-tridecene, and cis-decalin. The measurements were carried out utilizing a chemiluminescence apparatus specially designed for such measurements at elevated temperatures (100-400C). Methodology for its use was developed. Author (GRA)

N74-29491# California Univ., Berkeley. Dept. of Chemical Engineering.
THE ROLE OF HALOGENS IN THE PLASMA POLYMERIZATION OF HYDROCARBONS
H. Kobayashi, M. Shen, and A. T. Bell 1 Apr. 1974 34 p refs
(Contract N00014-69-A-0200-1053; NR Proj. 356-526)
(AD-778682; TR-9) Avail: NTIS CSCL 07/3

Vinyl chloride, vinyl fluoride and tetrafluoroethylene were polymerized in a radiofrequency electric glow discharge. It was found that when compared with the unhalogenated simple hydrocarbons, the rates of polymer deposition are in the order of vinyl chloride, acetylene, tetrafluoroethylene, vinyl fluoride, ethylene. This observation can be rationalized by considering the ease with which free radical and unsaturated species can be formed in the plasma. Infrared spectra and structure are compared after plasma and conventional polymerization. The halogenated compounds appear to act as a gas phase catalyst for the plasma polymerization of hydrocarbons. (Modified author abstract) GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-29492 British Broadcasting Corp., Kingswood (England). Research Dept.
AN ADAPTIVE RECEIVING SYSTEM FOR UHF TELEVISION
D. E. Susans Jun. 1974 12 p refs
(BBC-RD-1974/23) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A UHF television adaptive receiving system intended for use at transmitters fed by re-broadcast link, in cases where special measures are needed to reduce co-channel interference is described. The system automatically adjusts the directivity pattern of the receiving aerial array to place minima of response on bearings from which interfering signals are received. The equipment was designed to respond to interference in the demodulated video signal over the range 1 Hz to 5.5 MHz and to reject up to six interfering signals simultaneously. Many of the problems encountered with the design and operation of the equipment are described. Author

N74-29493 British Broadcasting Corp., Kingswood (England). Engineering Div.
DIGITAL SOUND SIGNALS: THE EFFECT OF TRANSMISSION ERRORS IN A NEAR-INSTANTANEOUS DIGITALLY COMPANDED SYSTEM
D. F. Reid and M. G. Croll Jun. 1974 10 p refs
(BBC-RD-1974/24) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Experiments are described which determined the audible effect of digit errors on near-instantaneous digitally companded sound signals. A method of error protection is proposed. Initial listening tests showed the digitally companded signals to be more immune to bit errors than linearly coded signals. To take advantage of this greater immunity a new error-protection scheme was devised. This scheme uses a little over half the number of error-protection bits per channel, as compared with the requirements of a system where the sound signals are linearly coded. Listening tests confirmed that, with the proposed error-protection

scheme, the effect of errors is similar to that in the linearly coded 13-channel pcm multiplex system in service with the BBC. Author

N74-29494# Technischen Universitaet, Munich (West Germany).
NEW PRINCIPLES OF TIME MULTIPLEXING AND CODING FOR IMPROVED TRANSMISSION QUALITY OF A PCM SYSTEM FOR LONG DISTANCE TELEPHONE SIGNALS Ph.D. Thesis [NEUE PRINZIPIEN FUER ZEITMULTIPLEX UND CODIERUNG ZUR VERBESERUNG DER UEBERTRAGUNGSGUALITAET EINES PCM-SYSTEMS FUER FERNSPRECHSIGNALE]
Waldemar Fruehauf 1973 132 p refs In GERMAN
Avail: NTIS HC $9.75

Processing of analog telephone signals into digits requires multiplexing, analog-to-digital conversion and the corresponding conversion into PCM systems for 30 to 120 channels. Improved video signal encoders reduce developing noise by introducing a scanning memory at the receiver that eliminates noise in the reconstructed analog signal. A pyramidic sectioning in both multiplexers reduces noise contributions of the real analog circuits and controls their working velocities. A new coding principle for PCM systems is developed that improves accuracy, high working velocity and processing of variable signals by including the compandor law in the analog decoding process. Transl. by G.G.

N74-29495*# Ohio State Univ., Columbus. ElectroScience Lab.
MILLIMETER WAVELENGTH PROPAGATION STUDIES Final Report, Dec. 1966 - Jun. 1974
D. B. Hodge Jul. 1974 18 p refs
(Grant NGR-36-008-080)
(NASA-CR-139366; FR-2374-18; ESL-2374-18) Avail: NTIS HC $4.00 CSCL 20N

The investigations conducted for the Millimeter Wavelength Propagation Studies during the period December, 1966, to June 1974 are reported. These efforts included the preparation for the ATS-5 Millimeter Wavelength Propagation Experiment and the subsequent data acquisition and data analysis. The emphasis of the OSU participation in this experiment was placed on the determination of reliability improvement resulting from the use of space diversity on a millimeter wavelength earth-space communication link. Related measurements included the determination of the correlation between radiometric temperature and attenuation along the earth-space propagation path. Along with this experimental effort a theoretical model was developed for the prediction of attenuation statistics on single and spatially separated earth space propagation paths. A High Resolution Radar/Radiometer System and Low Resolution Radar System were developed and implemented for the study of intense rain cells in preparation for the ATS-6 Millimeter Wavelength Propagation Experiment. Author

N74-29496*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CHANNEL CODING AND DATA COMPRESSION SYSTEM CONSIDERATIONS FOR EFFICIENT COMMUNICATION OF PLANETARY IMAGING DATA
Robert F. Rice 15 Jun. 1974 128 p refs
(Contract NAS7-100)
(NASA-CR-139362; JPL-TM-33-695) Avail: NTIS HC $9.50 CSCL 09F

End-to-end system considerations involving channel coding and data compression which could drastically improve the efficiency in communicating pictorial information from future planetary spacecraft are presented. Author

N74-29497*# Radio Corp. of America, Princeton, N.J.
GROUND-COMMANDED TELEVISION ASSEMBLY (GCTA) Final Report
29 Dec. 1972 114 p
(Contract NAS9-11260)
(NASA-CR-134351; R-3901-F) Avail: NTIS HC $8.75 CSCL 09F

The characteristics of the Ground-Commanded Television Assembly (GCTA) are discussed. The equipment was used to provide television coverage of lunar surface explorations during Apollo 15, 16, and 17 missions. The subjects include the following: (1) yoke/faceplate qualification data, (2) elevation drive improvement program, (3) Apollo 17 thermal data, (4) equipment status, and (5) drawing status. Illustrations of the components of the assembly are provided. Tables of data are developed to show the performance of the components. Author

N74-29498*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INTEGRAL EQUATION FORMULATION FOR PREDICTING RADIATION PATTERNS OF A SPACE SHUTTLE ANNULAR SLOT ANTENNA
J. Earl Jones and J. H. Richmond (Ohio State Univ.) Washington Aug. 1974 81 p refs Prepared in cooperation with Ohio State Univ.
(Grant NGL-36-008-138)
(NASA-TN-D-7594; L-9279) Avail: NTIS HC $4.00 CSCL 17B

An integral equation formulation is applied to predict pitch- and roll-plane radiation patterns of a thin VHF/UHF (very high frequency/ultra high frequency) annular slot communications antenna operating at several locations in the nose region of the space shuttle orbiter. Digital computer programs used to compute radiation patterns are given and the use of the programs is illustrated. Experimental verification of computed patterns is given from measurements made on 1/35-scale models of the orbiter. Author

N74-29499*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS), USERS' GUIDE
10 Jun. 1974 79 p
(NASA-TM-X-70710; X-805-74-176) Avail: NTIS HC $7.00 CSCL 17I

The system concept and characteristics are described along with support and orbital coverage capabilities. Information on user acquisition procedures is given. System impact on single and multiple access users is discussed. E.J.O.

N74-29500*# Westinghouse Electric Corp., Baltimore, Md.
ATS-5 RANGING RECEIVER AND L-BAND EXPERIMENT. VOLUME 2: DATA REDUCTION AND ANALYSIS Final Report
Dec. 1971 127 p refs
(Contract NAS5-21598)
(NASA-CR-139033) Avail: NTIS HC $9.50 CSCL 17B

The results of ranging and position location experiments performed at the NASA Application Technology Satellite ground station at Mojave California are presented. The experiments are simultaneous C-band and L-band ranging to ATS-5, simultaneous C-band and VHF ranging, simultaneous 24-hour ranging and position location using ATS-1, ATS-3, and ATS-5. The data handling and processing technique is also described. Author

N74-29501# Oak Ridge National Lab., Tenn.
EFFECTS OF ELECTROMAGNETIC PULSE (EMP) ON STATE AND LOCAL RADIO COMMUNICATIONS Final Report
P. R. Barnes Feb. 1974 186 p refs
(Contract W-7405-eng-26)
(ORNL-4873) Avail: NTIS HC $7.60

The electromagnetic pulse (EMP) produced by a high-altitude nuclear detonation consists of a transient pulse of high intensity electromagnetic fields. These intense fields induce current and voltage transients in electrical conductors. If these transients are well coupled to electronic circuits, equipment malfunction or failure may result. Analytical, numerical, and experimental techniques were used to determine the effects of EMP on the two-way radio communication systems available for civil defense. The results indicate that the probabilities of failure for two-way radio communication systems without EMP protection are strong functions of the radio carrier frequencies that compose the electromagnetic links of the systems. The probabilities of failure are also a relatively strong function of the EMP's amplitude and time history, the active electronics components employed in the communications equipment, gain and type of antennas in the system, the use of RF overload protection, and system configurations. Author (NSA)

N74-29502# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
AUDIO TRANSDUCER RESEARCH Semiannual Technical Report, 29 Jun. - 31 Dec. 1973
F. Dixon, M. E. Sikorski, F. R. Williamson, and R. A. Newsom Feb. 1974 46 p refs
(Contract DAAB07-73-C-0238; DA Proj. 1S7-62701-AH-92)
(AD-777518; ECOM-0238-1-73) Avail: NTIS CSCL 17/2

Audio transducers based on the piezoresistive and stressed-transistor principles were investigated for possible use in future tactical communications systems. The goal is to develop small (low visibility), light weight, hands-free microphones that can operate satisfactorily in a high noise environment. Although air-pathway noise-cancelling devices are also to be considered, the study focussed on speech pickup through the surface of the head or neck by means of either pressure microphones (using air as a coupling medium) or vibration transducers (using an elastomeric coupling, or more direct contact with the skin). (Modified author abstract) GRA

N74-29503# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A COMPUTER CODE FOR HIGH ALTITUDE EMP M.S. Thesis
Terry C. Chapman Jan. 1974 81 p refs
(AD-777841; GNE/PH/74-1) Avail: NTIS CSCL 18/3

A relatively inexpensive computer code is developed to calculate the peak value of the electric field contained in an electromagnetic pulse generated by the gamma rays from a high altitude nuclear burst. The code is based on the Karzas and Latter theory for the production of Compton electrons and their interaction with the earth's magnetic field. The code can be used to calculate the peak value of the electric field at a target anywhere on or above ground level, resulting from a nuclear burst above 60 km altitude with a gamma yield up to 60 tons. Either the direct or the ground reflected wave can be calculated. With special care, bursts up to one kt of gamma yield can be used. Author (GRA)

N74-29504# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THEORY OF THE HIGH ALTITUDE ELECTROMAGNETIC PULSE M.S. Thesis
John R. Lillis Mar. 1974 120 p refs
(AD-777846; GNE/PH/74-723) Avail: NTIS CSCL 18/3

The thesis constitutes a microscopic approach to the electromagnetic pulse (EMP) caused by a high altitude nuclear weapon burst. This approach involves the detailed calculations for the time-dependent electromagnetic fields of a single relativistic, Compton electron created in the upper atmosphere by the gamma radiation from the weapon detonation. The effect of all such electrons created is superimposed to obtain the net effect or the EMP measured by an observer. The basic theory developed ignores the conductivity which builds up in the surrounding air. This is shown to be a relatively good assumption for weapons with gamma radiation yields less than a kiloton. (Modified author abstract) GRA

N74-29505# Naval Research Lab., Washington, D.C.
BASIC SYSTEM CONCEPT FOR INTEGRATING A 2D AND A 3D RADAR AND DESIGNS OF AUTOMATIC DETECTION Interim Report
Gerard V. Trunk, Ben H. Cantrell, and Donald F. Queen 7 Mar. 1974 33 p refs
(NRL Proj. R02-54)
(AD-777959; NRL-7678) Avail: NTIS CSCL 17/9

A basic system concept of digitally integrating any 2D radar and any frequency-scan 3D radar was applied to the SPS-12 and SPS-39 radars, giving a composite coverage with nulls greatly decreased from those of the SPS-12 pattern. Both radars operate in a search mode, automatic detection systems are associated with each radar, and the detection information is integrated via the tracking system. Height information is provided on targets designated by either the radar operator or the tracking computer. Three automatic detectors, a generalized sign nonparametric processor with adaptive thresholding, a rank detector, and a log-Raleigh detector, were designed. Using Monte Carlo techniques, probability of detection curves and angular accuracy curves were generated for these detectors. An unexpected result was little difference between the log-Rayleigh and rank detectors. Author (GRA)

N74-29506# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Microbiology.
HYDROGEN PRODUCTION BY PHOTOSYNTHESIS AND HYDROGENASE ACTIVITY Progress Report, 1 Jul. 1972 - 1 Mar. 1973
L. O. Kamptiz 14 Apr. 1973 49 p
(Grant NSF GI-34992X)
(PB-227748/1; NSF-RA/N-73-015) Avail: NTIS HC $5.50 CSCL 06A

The biophotolysis of water to hydrogen and oxygen by systems is discussed. Spinach chloroplasts forming reduced triphosphopyridine (TPNH) nucleotide photosynthetically and hydrogen formation from it are catalyzed by a bacteriel hydrogenase. Methyl viologen as electron acceptor and the blue-green algae, Anacystis nidulans, forming TPNH photosynthetically and hydrogen formation from it by bacterial hydrogenase are described. The synthesis of viologen dyes which may act as electron acceptors in the photosynthetic system is also considered. GRA

N74-29507# Federal Communications Commission, Washington, D.C. Office of the Chief Engineer.
DOUBLE SIDEBAND AND SINGLE SIDEBAND POWER AND VOLTAGE EQUIVALENCES
Irvin Hurwitz Nov. 1973 25 p ref
(PB-228180/6; R-7305) Avail: NTIS HC $4.25 CSCL 17B

The relationships are established between the various powers and voltages for different emission and modulations of interest. GRA

N74-29508# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SEA CLUTTER DATA COLLECTION AND ANALYSIS FOR THE DESIGN OF HARBOR SURVEILLANCE RADAR SYSTEMS Technical Report, Mar. - Aug. 1971
Oct. 1973 71 p refs
(Contract DOT-CG-03301-B)
(AD-779560; APL-MSC-73-341; USCG-D-38-74) Avail: NTIS CSCL 17/7

The report presents a description of a sea clutter measurements program conducted at San Francisco during spring and summer of 1971 in support of the San Francisco Experimental Vessel Traffic System (VTS) development program. Using a mobile instrumentation van containing a high resolution radar and associated signal processing electronics, sea clutter characteristics of the entrance channel (from Point Bonita) and the inner harbor (from Treasure Island) were determined. Author (GRA)

N74-29509# Technische Hogeschool, Delft (Netherlands).
ESTIMATION OF PARAMETERS OF LINEAR SYSTEMS USING PERIODIC TEST SIGNALS
Adriaan VanDenBos 1974 157 p refs
Avail: NTIS HC $11.00

A procedure is developed for estimating parameters of linear systems from noise corrupted responses to periodic test signals. The class of linear systems is restricted to linear systems describable by an ordinary linear differential equation. The parameters to be estimated are the coefficients of the differential equation and a time delay in series with the system. The proposed procedure is a weighted least squares procedure operating on the estimates of the Fourier coefficients of the test signal and those of the response. The estimator of the coefficients of the differential equation is a simple closed form expression in the estimator of the Fourier coefficients. The estimates are obtained in a single computational step. No iterations are required. The time delay is estimated by repeating the procedure for a number of values of time delay and selecting the best fitting solution. Author

N74-29510# Army Electronics Command, Fort Monmouth, N.J.
ERROR CONTROL TECHNIQUES FOR LINE-OF-SIGHT
John E. Quigley and Gregory C. Ranieri May 1974 18 p refs
(DA Proj. 1S7-62701-AH-92)
(AD-778749; ECOM-4216) Avail: NTIS CSCL 17/2

The report deals with the characteristics of the line-of-sight

communications channel. It delves into the noise phenomenon commonly encountered on the channel with emphasis placed on the types of noise found on this particular link, Fort Hancock, New Jersey to Camp Kilmer, New Jersey. Recommendations for combatting these noise problems, based on field test results, are given. The application of error control coding has been shown to be the least effective method for alleviating the noise problems on well engineered links such as this. Author (GRA)

N74-29511# Army Communications Command, Fort Huachuca, Ariz. Advanced Concepts Office.
THE 35 GHz STRATOSPHERIC PROPAGATION
L. E. Vogler and L. E. Wood Apr. 1974 43 p refs
(AD-779519; ACC-ACO-3-74) Avail: NTIS CSCL 17/2

A recent translation of a Russian paper purports to have established a new long range communication link at 30-45 GHz using reflections from a stratospheric layer. Because of certain questionable aspects of the translation, a study has been undertaken to explore what mechanisms might exist for propagation via the stratosphere at gigahertz frequencies. It is concluded that some mechanisms are possible but none are very probable. The most likely means might be one making use of the whispering gallery effect. Author (GRA)

N74-29512# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
A HIGH RESOLUTION POWER SPECTRAL ESTIMATE: THE MAXIMUM ENTROPY METHOD
Henry R. Radoski, Paul F. Fougere, and Edward J. Zawalick 13 Feb. 1974 25 p refs
(AF Proj. 8601)
(AD-779693; AFCRL-AFSIG-282; AFCRL-TR-74-0088) Avail: NTIS CSCL 09/4

A new spectral estimate, the maximum entropy method, is described. In the maximum entropy method, the entropy change of a signal is maximized under the constraint that the autocorrelation function is the Fourier transform of the spectral power density. The problem reduces to specifying a unit-distance prediction error filter or, equivalently, a whitening filter. The spectral estimates are calculated in two ways: (1) by minimizing the error power to obtain the coefficients of the prediction error filter, as suggested by Burg and, (2) by a direct solution of the matrix equation using an algorithm due to Levinson. These results are compared with a modified Blackman-Tukey technique, calculated with a Hamming window. Applications of the maximum entropy method to geomagnetic micropulsations and to the annual sunspot number are shown. (Modified author abstract) GRA

N74-29513# Transportation Systems Center, Cambridge, Mass.
DESCRIPTION OF A REMOTE IONOSPHERIC SCINTILLATION DATA COLLECTION FACILITY Interim Report, Jul. 1972 - Mar. 1973
W. E. Brown, III, G. G. Haroules, and W. I. Thompson, III Mar. 1974 94 p refs
(PB-230893/0; DOT-TSC-OST-73-17) Avail: NTIS HC $4.00 CSCL 20N

An experimental technique is described which measures L-band ionospheric scintillation at a remote, unmanned site. Details of an automatic data collection facility are presented. The remote facility comprises an L-band receiver, and a complete VHF command and control telemetry link which are coupled through an integral computer. The remote facility is controlled from a central data collection facility via the VHF link through either the ATS-1 or ATS-3 spacecrafts. L-band scintillation measurements taken at the remote facility are also relayed through the spacecraft to the central facility. GRA

N74-29514# Naval Research Lab., Washington, D.C.
OBSERVED STATISTICAL BEHAVIOR OF RADAR MOON ECHO SIGNALS Interim Report
Lorenzo J. Abella 2 May 1974 21 p refs
(NRL Proj. R06-30)
(AD-779252; NRL-7717) Avail: NTIS CSCL 03/2

The observed statistical behavior of radar Moon echo signals at a transmitted radio frequency of 138.6 MHz has been analyzed. The results of the data analysis are in terms of plots for averaged Moon echoes, ensemble autocorrelation functions, and sample probability density functions at a fixed range. An empirical modeling of the data was attempted by curve fitting the results. Author (GRA)

N74-29515# Naval Research Lab., Washington, D.C.
ANALYSIS OF A DUAL FREQUENCY MTI SYSTEM Interim Report
James K. Hsiao 6 May 1974 20 p refs
(NRL Proj. R02-99; RF12151403)
(AD-779251; NRL-7709) Avail: NTIS CSCL 17/9

The problem of a two-frequency moving target indicators (MTI) system in a general case has been formulated. The author concludes that (a) the two-frequency MTI system sees an increased clutter-Doppler variance as compared to that of a single-frequency system (from sigma squared to sigma squared (1 - r squared) where r is the ratio of the carrier frequencies in the two frequency channels) and (b) the mean clutter-Doppler frequency, at the same time, is reduced accordingly from f sub 0 to f sub 0 (1 - r). Author (GRA)

N74-29516# Lincoln Lab., Mass. Inst. of Tech., Lexington.
MILLSTONE HILL RADAR PROPAGATION STUDY: CALIBRATION Joint Radar Propagation Study
John V. Evans, ed. 5 Oct. 1973 130 p refs Prepared in cooperation with Bell Telephone Labs., Inc., Murray Hill, N. J. (Contracts F19628-73-C-0002; DAHC60-71-C-0005; DA Proj. 7X2-63304-D-215)
(AD-779689; TR-508; ESD-TR-73-254) Avail: NTIS CSCL 17/9

The report describes the work conducted to obtain a precise calibration of the tracking system at UHF and at L-band. The method finally employed entailed the measurement of the mechanical position of the antenna (elevation, azimuth, platform tilt) with great accuracy, together with tracking exercises to relate the RF and mechanical axes of the antenna. For the L-band radar the latter included observations of bright radio stars and numerous passes of the same (Navy Navigation System) satellites that could be combined to give a precise orbit. Calibration of the UHF beacon tracker was necessary to remove the dependence on the polarization of the received signals in addition to the expected errors (beam offsets and beam droop). This was achieved through describing the effects by models whose free parameters were determined by comparing the observed position of the satellite beacons with the true position determined from the L-band radar multipass solutions. Of necessity, this calibration had to be conducted using only nighttime satellite tracking data in order to minimize bias errors introduced by ionospheric refraction. (Modified author abstract) GRA

N74-29517# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVALUATION OF COMPRESSED-PULSE DISTORTIONS CAUSED BY THE INSTABILITY OF THE AMPLITUDE-FREQUENCY AND PHASE-FREQUENCY CHARACTERISTICS OF A FLOATING-TUBE KLYSTRON
M. I. Minaev 11 Apr. 1974 8 p refs Transl. into ENGLISH from Novye Razrabotki Elementov Radiotekh. Ustroistv. Resp. Mezhduved. Sbornik (USSR), no. 1, 1972 p 293-242
(AD-778562; FTD-HT-23-1444-74) Avail: NTIS CSCL 17/9

The presence of distortions of the amplitude-frequency characteristics of the klystron increases the requirements for phase stability at the assigned side lobe level for the output pulse of the compressive filter. At the assigned levels of side lobes and pulsations in the amplitude-frequency characteristics, the detuning of the klystron's resonators increases the requirements for the phase stability of the klystron's output signal. GRA

N74-29518# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
CLUTTER REDUCTION TECHNIQUES Final Report, 7 Mar. 1973 - 7 Mar. 1974
W. E. Meyer Mar. 1974 33 p refs
(Contract N00019-73-C-0280)
(AD-779292; C73-373-501) Avail: NTIS CSCL 17/9

The report contains a description of work performed toward constructing and testing surface acoustic wave devices for signal processing methods to reduce clutter and interfering signals in operating radar systems. The specific system to be used as a test bed to determine the validity of the concept in system

environment was the APG-59. The report is written in three parts. Part I describes the general system interface problems and design parameters of surface acoustic wave devices, followed by discussion of the fabrication and testing of the experimental tapped delay line. Part II discusses the recommendations for future effort, while Part III is a collection of reference material providing a more detailed technical background for understanding the operation of acoustic devices. Author (GRA)

N74-29519# Naval Research Lab., Washington, D.C.
A TWO-POLE FILTER FOR USE WITH A SCANNING RADAR Interim Report
Ben H. Cantrell and Gerard V. Trunk 7 May 1974 16 p refs
(AD-779253; NRL-7716) Avail: NTIS CSCL 17/9

A two-pole filter was proposed as a detector for a scanning radar. The optimum values of the filter coefficients were found and are approximated by a simple expression. The optimum two-pole filter requires a 0.15-db increase in signal-to-noise ratio in order to provide the same detection capability as the optimum detector and yields azimuth estimates whose standard deviation is within 15% of the Cramer-Rao lower bound. The estimator is simple to implement since it avoids the storage requirements of the moving window detector and the bias complications of the feedback integrator. Author (GRA)

N74-29520# California State Univ., San Jose. Dept. of Speech-Communication.
THE STUDY OF COMMUNICATION NETWORKS AND COMMUNICATION STRUCTURE IN LARGE ORGANIZATIONS
Peter R. Monge and Georg N. Lindsey Apr. 1974 45 p Prepared in cooperation with Stanford Univ., Calif.
(Contract N00014-73-A-0476-0001; NR Proj. 170-763)
(AD-779304; QTR-1) Avail: NTIS CSCL 17/2

Communication networks consist of the regular patterns of interpersonal communication contacts which develop among people within an organization as they use various forms of communication (face-to-face meetings, memos, telephone calls, etc.) to accomplish the daily activities of an organization. Information regarding the functioning of the various types of human networks is important since it can be used to understand the organizational process and to assess its effectiveness and efficiency. The report describes a set of procedures for analyzing these networks in large organizations. These include: (1) identification and evaluation of various kinds of networks, (2) assessment of the organizational hierarchy, (3) appraisal of various departments within the organization, and (4) evaluation of individual communication behavior. (Modified author abstract) GRA

N74-29521# Sperry Gyroscope Co., Great Neck, N.Y. Radiation Div.
THE CORRELATION RADAR FOR COMBAT SURVEILLANCE
S. Dunn, P.03Randise Rademacher, D., W. Fishbein, and O. Rittenbach Feb. 1974 28 p refs
(Contract DA-36-039-AMC-03191(E); DA Proj. 1Z6-62704-A-188)
(AD-779415; ECOM-4191) Avail: NTIS CSCL 17/9

An exploratory research model of a lightweight, low power consuming, man-portable radar system was developed, capable of detecting, locating and presenting fixed and/or moving targets of interest in a battlefield environment. The CW radar transmission utilizes three modulations: a pseudo-random phase-reversal modulation to obtain range resolution by correlation of the received single with a replica of the transmitted code; a low deviation sinewave frequency modulation for effectively cancelling the inverse 4th power variation of returned signal with range; and a large deviation sinewave frequency modulation for fixed target presentation. For rapid search of an assigned sector, multiple range channels and adjustable automatic scanning are provided. Fixed and moving targets are displayed by A-scope, B-scope and earphones. Author (GRA)

N74-29522# Test Group (6585th), Holloman AFB, N.Mex.
RADAR CROSS SECTION MEASUREMENTS ON A BQM-34F TARGET DRONE, VOLUME 4A Final Report
Nov. 1973 279 p
(AD-777597; AFSWC-TR-72-20-Vol-4A) Avail: NTIS CSCL 17/9

The report documents radar cross section measurements of a BQM-34F target drone with active radar cross section augmentation. Part a presents the augmented cross section data acquired from the BQM-34F clean configuration with augmentation forward. GRA

N74-29523# Test Group (6585th), Holloman AFB, N.Mex. 17/9
RADAR CROSS SECTION MEASUREMENTS ON A BQM-34F TARGET DRONE, VOLUME 4B
Nov. 1973 239 p
(AD-778074; AFSWC-TR-72-20-Vol-4B) Avail: NTIS

Augmented radar cross section data were acquired from a BQM-34F remotely piloted vehicle (RPV) at the U. S. Air Force Special Weapons Centers: Radar Target Scatter Facility, (RAT SCAT), 6585th Test Group, Holloman AFB, New Mexico. The BQM-34F vehicle was configured to provide comparison and coverage data for two active radar cross section augmentation systems. Data were acquired for three combinations of radar and radar/infrared (IR) augmentation pods using horizontal and vertical measurement system antenna polarizations. A frequency of 9130 MHz was used to perform measurements of the left wing active, right wing active, forward, and aft augmentation system configurations as applicable. This report contains a description of the measurement conditions as well as reproductions of the raw and processed data. (Modified author abstract) GRA

N74-29524# Test Group (6585th), Holloman AFB, N.Mex.
RADAR CROSS SECTION MEASUREMENTS ON A BQM-34F TARGET DRONE, VOLUME 4C
Nov. 1973 147 p
(AD-777598; AFSWC-TR-72-20-Vol-4C) Avail: NTIS CSCL 17/9

The report documents radar cross section measurements of a BQM-34F target drone with active radar cross section augmentation and is Volume IV of a five part publication. Part C presents augmented cross section data acquired from the BQM-34F vehicle configured with RCS and RCS/IR augmentation pods. GRA

N74-29525# Naval Postgraduate School, Monterey, Calif.
USING THE MOBILE DATA COMMUNICATIONS TERMINAL AN/TYC-5 AS AN AUTODIN TERMINAL M.S. Thesis
Bruce David Thoreson Mar. 1974 131 p refs
(AD-778639) Avail: NTIS CSCL 17/2

The thesis examines the use of the TYC-5 as an AUTODIN terminal, working from a remote location into AUTODIN. Emphasis is placed on examining the various transmission mediums used to support the TYC-5. Included are cable, micro-wave, tropospheric scatter, high frequency radio and satellite. Required accessories; operational experiences; expected reliabilities and efficiencies; and operational parameters/constraints are examined for each medium. The shortfalls that exist today in providing each of the mediums are identified. The responsibilities for providing support to eliminate these shortfalls are also identified. The conclusions show the preferred TYC-5/transmission medium combination to be with cable/micro-wave. The most critical shortfalls are also identified. The twelve recommendations are actions that should be taken to reduce shortfalls and provide for better high data rate communications from a remote area. Author (GRA)

N74-29526# Computer Sciences Corp., Falls Church, Va.
COMMUNICATIONS SUPPORT REQUIREMENTS (COMSR) STUDY, VOLUME 7, APPENDIX B, PART 3 Final Report, Nov. 1972 - Dec. 1973
Arthur W. Reese and Arnold Rathlev 15 Dec. 1973 538 p
(Contract DAAG11-70-C-0875)
(AD-778179) Avail: NTIS CSCL 17/2

The volume presents COMSR communication requirements data developed for force model typical units. GRA

N74-29818* Kanner (Leo) Associates, Redwood City, Calif.
A METHOD OF DIAGNOSTICS OF THE DYNAMIC STABILITY OF THE CARRIER IN A MAGNETIC RECORDING PLAYBACK CIRCUIT
G. A. Petrulis and I. Gasyunas *In its* Cybernetic Diagnostics of

Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 107-109 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustitcheskim Protsessam" Kaunas, KPI Press, 1972 p 101-103 (For availability see N74-29785 19-15)
CSCL 14C

N74-29862* Kanner (Leo) Associates, Redwood City, Calif.
VIBRATION RESISTANCE OF THE WIRE-FEED MECHANISM OF A MAGNETIC RECORDING APPARATUS
S. P. Kitra and R.-T. A. Tolochka *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 271-274 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustitcheskim Protsessam" Kaunas, KPI Press, 1972 p 243-245 (For availability see N74-29785 19-15)
CSCL 14C

N74-29864* Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF IRREGULARITIES IN ANGULAR VELOCITIES OF ROTATING ASSEMBLIES IN MEMORY DEVICES ON MAGNETIC CARRIERS
G. I. Virakas, R. A. Matsyulevichyus, K. P. Minkevichyus, Z. I. Potsyus, and B. D. Shirvinskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 279-282 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustitcheskim Protsessam" Kaunas, KPI Press, 1972 p 250-253 (For availability see N74-29785 19-15)
CSCL 14C

N74-29870* Kanner (Leo) Associates, Redwood City, Calif.
STATISTICAL DETERMINATION OF THE ACCURACY OF RECORDING OF A HIGH-SPEED ELECTROSTATIC RECORDER
A.-A. P. Laurutis and V. P. Laurutis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 296-299 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustitcheskim Protsessam" Kaunas, KPI Press, 1972 p 266-269 (For availability see N74-29785 19-15)
CSCL 14C

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-29527* Electronic Communications, Inc., St. Petersburg, Fla.
ACTUATOR DIGITAL INTERFACE UNIT (AIU) Final Report
Oct. 1973 448 p
(Contract NAS8-26755)
(NASA-CR-120328) Avail: NTIS HC $25.50 CSCL 09B

Alternate versions of the actuator interface unit are presented. One alternate is a dual-failure immune configuration which feeds a look-and-switch dual-failure immune hydraulic system. The other alternate is a single-failure immune configuration which feeds a majority voting hydraulic system. Both systems communicate with the data bus through data terminals dedicated to each user subsystem. Both operational control data and configuration control information are processed in and out of the subsystem via the data terminal which yields the actuator interface subsystem, self-managing within its failure immunity capability. Author

N74-29528*# Vanzetti Infrared and Computer Systems, Inc., Canton, Mass.
DESIGN, TESTING, AND DELIVERY OF AN INTERACTIVE GRAPHICS DISPLAY SUBSYSTEM Final Report
Bruce Holmes 14 Sep. 1973 113 p refs
(Contract NAS8-28436)
(NASA-CR-120334) Avail: NTIS HC $8.75 CSCL 09B

An interactive graphics display system was designed to be used in locating components on a printed circuit card and outputting data concerning their thermal values. The manner in which this was accomplished in terms of both hardware and software is described. An analysis of the accuracy of this approach is also included. Author

N74-29529*# Michigan Univ., Ann Arbor.
ON-LINE DIAGNOSIS OF UNRESTRICTED FAULTS
John F. Meyer and Robert J. Sundstrom [1974] 35 p refs (Grant NGR-23-005-622)
(NASA-CR-139375) Avail: NTIS HC $4.75 CSCL 09B

A formal model for the study of on-line diagnosis is introduced and used to investigate the diagnosis of unrestricted faults. A fault of a system S is considered to be a transformation of S into another system S' at some time tau. The resulting faulty system is taken to be the system which looks like S up to time tau, and like S' thereafter. Notions of fault tolerance error are defined in terms of the resulting system being able to mimic some desired behavior as specified by a system similar to S. A notion of on-line diagnosis is formulated which involves an external detector and a maximum time delay within which every error caused by a fault in a prescribed set must be detected. It is shown that if a system is on-line diagnosable for the unrestricted set of faults then the detector is at least as complex, in terms of state set size, as the specification. The use of inverse systems for the diagnosis of unrestricted faults is considered. A partial characterization of those inverses which can be used for unrestricted fault diagnosis is obtained. Author

N74-29530# Technische Hochschule, Darmstadt (West Germany).
COMPUTERIZED PROCESSING TREND MODEL FOR THE STANDARDIZED SIMULATION, ANALYSIS, AND CONTROL OF REAL SYSTEMS Ph.D. Thesis [TRENDMODELL ZUR STANDARDISIERTEN NACHBILDUNG, ANALYSE UND FUEHRUNG REALER SYSTEME UNTER VERWENDUNG VON PROZESSRECHNERN]
Mohamed Shahata 1973 206 p refs In GERMAN
Avail: NTIS HC $13.50

A standardized technical control concept for on-line analysis and management of industrial processes is developed. Modern control principles as well as practical aspects of real processes and calculation techniques are considered in modelling and analyzing the real process. Transl. by G.G.

N74-29531# Arbeitsgemeinschaft fuer Datenverarb- eitung, Vienna (Austria).
THE 4TH INTERNATIONAL CONGRESS ON DATA PROCESSING IN EUROPE [4. INTERNATIONALER KONGRESS "DATENVERARBEITUNG IM EUROPAISCHEN RAUM"]
26 Oct. 1973 558 p refs In ENGLISH and GERMAN Conf. held at Innsbruck, 22-26 Oct. 1973
Avail: NTIS HC $31.00

Conference papers consider the various aspects of computer utilization in industrial processes and the economic effects and social impact of automatic information processes in production engineering. Transl. by G.G.

N74-29532*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ON THE RECOGNITION OF COMPLEX STRUCTURES: COMPUTER SOFTWARE USING ARTIFICIAL INTELLIGENCE APPLIED TO PATTERN RECOGNITION
Yoram Yakimovsky 1 May 1974 13 p refs
(Contract NAS7-100)
(NASA-CR-139363: JPL-TM-33-693) Avail: NTIS HC $4.00 CSCL 09B

An approach to simultaneous interpretation of objects in complex structures so as to maximize a combined utility function is presented. Results of the application of a computer software system to assign meaning to regions in a segmented image based on the principles described in this paper and on a special interactive sequential classification learning system, which is referenced, are demonstrated. Author

N74-29533*# Alabama Univ., University. Communication Systems Group.
DESIGN OF FIR DIGITAL FILTERS FOR PULSE SHAPING AND CHANNEL EQUALIZATION USING TIME-DOMAIN OPTIMIZATION Final Report

Ronald C. Houts and Gregg L. Vaughn May 1974 92 p refs (Contract NAS8-20172)
(NASA-CR-120340; BER-167-102) Avail: NTIS HC $7.75 CSCL 09B

Three algorithms are developed for designing finite impulse response digital filters to be used for pulse shaping and channel equalization. The first is the Minimax algorithm which uses linear programming to design a frequency-sampling filter with a pulse shape that approximates the specification in a minimax sense. Design examples are included which accurately approximate a specified impulse response with a maximum error of 0.03 using only six resonators. The second algorithm is an extension of the Minimax algorithm to design preset equalizers for channels with known impulse responses. Both transversal and frequency-sampling equalizer structures are designed to produce a minimax approximation of a specified channel output waveform. Examples of these designs are compared as to the accuracy of the approximation, the resultant intersymbol interference (ISI), and the required transmitted energy. While the transversal designs are slightly more accurate, the frequency-sampling designs using six resonators have smaller ISI and energy values. Author

N74-29534# Eidgenossische Technische Hochschule, Zurich (Switzerland).
COMPUTER AIDED SYNTHESIS OF DIGITAL FILTERS IN THE FREQUENCY DOMAIN Ph.D. Thesis
Andrew Gustav Deczky 1973 174 p refs
(Rept-4980) Avail: NTIS HC $11.75

The problem of designing recursive digital filters to have certain prescribed characteristics in the frequency domain is treated. Four methods for the solution of this problem are worked out in detail. The first method is based on the transformation of the problem to the classical analog domain, and the subsequent use of the existing classical solutions. The second method uses a different transformation and the properties of Chebyshev rational functions to get filters with equiripple passband and arbitrary stopband or equiripple stopband and arbitrary passband. The third method uses a descent algorithm to obtain minimum p approximations to completely arbitrary magnitude, group delay or combined magnitude and group delay specifications. Finally the fourth method is based on Remes' second algorithm to get best Chebyshev approximations to certain loss and group delay characteristics. Author

N74-29535*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
ON-LINE DIAGNOSIS OF SEQUENTIAL SYSTEMS, 2
R. J. Sundstrom Jul. 1974 163 p refs
(Grant NGR-23-005-622)
(NASA-CR-139372; UMICH-012146-1-T; SEL-TR-81) Avail: NTIS HC $11.25 CSCL 09B

The theory and techniques applicable to the on-line diagnosis of sequential systems, were investigated. A complete model for the study of on-line diagnosis is developed. First an appropriate class of system models is formulated which can serve as a basis for a theoretical study of on-line diagnosis. Then notions of realization, fault, fault-tolerance and diagnosability are formalized which have meaningful interpretations in the the context of on-line diagnosis. The diagnosis of systems which are structurally decomposed and are represented as a network of smaller systems is studied. The fault set considered is the set of faults which only affect one component system is the network. A characterization of those networks which can be diagnosed using a purely combinational detector is achieved. A technique is given which can be used to realize any network by a network which is diagnosable in the above sense. Limits are found on the amount of redundancy involved in any such technique.
Author

N74-29536*# Intermetrics, Inc., Cambridge, Mass.
HAL/S PROGRAMMER'S GUIDE
P. M. Newbold and R. L. Hotz 3 Jul. 1974 190 p
(Contract NAS9-13864)
(NASA-CR-134371; IR-63-3) Avail: NTIS HC $12.50 CSCL 09B

This programming language was developed for the flight software of the NASA space shuttle program. HAL/S is intended to satisfy virtually all of the flight software requirements of the space shuttle. To achieve this, HAL/s incorporates a wide range of features, including applications-oriented data types and organizations, real time control mechanisms, and constructs for systems programming tasks. As the name indicates, HAL/S is a dialect of the original HAL language previously developed. Changes have been incorporated to simplify syntax, curb excessive generality, or facilitate flight code emission. Author

N74-29537# Electrotechnical Lab., Tokyo (Japan).
A SURVEY AND EVALUATION OF INNOVATIVE COMPUTER ARCHITECTURES
Hajime Iizuka, Kensuke Fujii, Toshitsugu Yuba, and Toshio Shimada Feb. 1974 115 p refs In ENGLISH and JAPANESE
(Circ-179) Avail: NTIS HC $8.75

Six architectures of microprogram computers are surveyed. Tagged architectures, parallel processors, high level language directed computers, and multiprocessors are also considered. Evaluation standards and tables of results are presented, including parallel processing, variable structure, and hardwarenization of functions. Author

N74-29538*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USERS GUIDE FOR INFORMATION RETRIEVAL USING APL
Arthur Shapiro Aug. 1974 18 p
(NASA-TM-X-69914; NSSDC-74-11) Avail: NTIS HC $4.00 CSCL 09B

A Programming Language (APL) is a precise, concise, and powerful computer programming language. Several features make APL useful to managers and other potential computer users. APL is interactive; therefore, the user can communicate with his program or data base in near real-time. This, coupled with the fact that APL has excellent debugging features, reduces program checkout time to minutes or hours rather than days or months. Of particular importance is the fact that APL can be utilized as a management science tool using such techniques as operations research, statistical analysis, and forecasting. The gap between the scientist and the manager could be narrowed by showing how APL can be used to do what the scientists and the manager each need to do, retrieve information. Sometimes, the information needs to be retrieved rapidly. In this case APL is ideally suited for this challenge. Author

N74-29539*# Intermetrics, Inc., Cambridge, Mass.
HAL/S-FC COMPILER SYSTEM FUNCTIONAL SPECIFICATION
24 Jul. 1974 81 p ref
(Contract NAS9-13864)
(NASA-CR-134372; IR-59-4) Avail: NTIS HC $7.25 CSCL 09B

Compiler organization is discussed, including overall compiler structure, internal data transfer, compiler development, and code optimization. The user, system, and SDL interfaces are described, along with compiler system requirements. Run-time software support package and restrictions and dependencies are also considered of the HAL/S-FC system. J.A.M.

N74-29540*# TRW Systems Group, Houston, Tex.
HOUSTON OPERATIONS PREDICTOR/ESTIMATOR (HOPE) PROGRAMMING MANUAL VOLUME 1
J. K. Daly 25 Jan. 1974 236 p
(Contract NAS9-13834)
(NASA-CR-134368; TRW-25990-H004-R0-00-Vol-1; TRW-74-FMT-932-Vol-1) Avail: NTIS HC $15.00 CSCL 09B

The programming techniques used to implement the equations and mathematical techniques of the Houston Operations Predictor/Estimator (HOPE) orbit determination program on the UNIVAC 1108 computer are described. Detailed descriptions are given of the program structure, the internal program structure, the internal program tables and program COMMON, modification and maintainence techniques, and individual subroutine documentation. Author

N74-29541# Leeds Univ. (England). Operational Research Unit.
OPTIMAL PROJECT SCHEDULING UNDER MULTIPLE RESOURCE CONSTRAINTS

Allan Humphreys and Thierry Scheurer May 1973 67 p refs (Rept-19) Avail: NTIS HC $6.50

A new dynamic programming type algorithm for optimal project scheduling under multiple resource constraints is presented. This procedure belongs to a class of algorithms whose common features are initially described in a unified approach. This common approach makes it possible to relate some important characteristics of the new algorithm to the corresponding characteristics of another algorithm in the same class, much more closely than could be done otherwise. Some of the results obtained so far from this comparison are given and proved. Author

N74-29542*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A REAL-TIME DIGITAL COMPUTER PROGRAM FOR THE SIMULATION OF A SINGLE ROTOR HELICOPTER

Jacob A. Houck, Lucille H. Gibson (Electronic Assoc., Inc.), and George G. Steinmetz Washington Jun. 1974 164 p refs (NASA-TM-X-2872; L-9002) Avail: NTIS HC $5.00 CSCL 09B

A computer program was developed for the study of a single-rotor helicopter on the Langley Research Center real-time digital simulation system. Descriptions of helicopter equations and data, program subroutines (including flow charts and listings), real-time simulation system routines, and program operation are included. Program usage is illustrated by standard check cases and a representative flight case. Author

N74-29543*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPUTER PROGRAMS FOR CALCULATION OF MATRIX STABILITY AND FREQUENCY RESPONSE FROM A STATE-SPACE SYSTEM DESCRIPTION

Robert C. Seidel Jul. 1974 23 p refs (NASA-TM-X-71581; E-8016) Avail: NTIS HC $3.00 CSCL 09B

FORTRAN computer subroutines stemming from requirements to process state variable system equations for systems of high order are presented. They find the characteristic equation of a matrix using the method of Danilevsky, the number of roots with positive real parts using the Routh-Horwitz alternate formulation, convert a state variable system description to a Laplace transfer function using the method of Bollinger, and evaluate that transfer function and obtain its frequency response. A sample problem is presented to demonstrate use of the subroutines. Author

N74-29544*# Illinois Univ., Urbana. Center for Advanced Computation.

IMPLEMENTATION OF ILLIAC 4 ALGORITHMS FOR MULTISPECTRAL IMAGE INTERPRETATION Final Report, Mar. 1973 - Feb. 1974

Robert M. Ray, John D. Thomas, Walter E. Donovan, and Philip H. Swain (Purdue Univ.) Jun. 1974 26 p refs (Grant NGR-14-005-202; Contract DAHC04-75-C-0001; ARPA Order 1899) (NASA-CR-139214; CAC-112) Avail: NTIS HC $4.50 CSCL 05B

Research has focused on the design and partial implementation of a comprehensive ILLIAC software system for computer-assisted interpretation of multispectral earth resources data such as that now collected by the Earth Resources Technology Satellite. Research suggests generally that the ILLIAC 4 should be as much as two orders of magnitude more cost effective than serial processing computers for digital interpretation of ERTS imagery via multivariate statistical classification techniques. The potential of the ARPA Network as a mechanism for interfacing geographically-dispersed users to an ILLIAC 4 image processing facility is discussed. Author

N74-29545*# Maryland Univ., College Park. Computer Science Center.

GLOBAL PARALLEL UNIFICATION FOR LARGE QUESTION-ANSWERING SYSTEMS

J. Gary Auguston and Jack Minker Jun. 1974 43 p refs (Grant NGR-21-002-270) (NASA-CR-139212; TR-307) Avail: NTIS HC $5.25 CSCL 09B

An efficient means of storing data in a first-order predicate calculus theorem-proving system is described. The data structure is oriented for large scale question-answering (QA) systems. An algorithm is outlined which uses the data structure to unify a given literal in parallel against all literals in all clauses in the data base. The data structure permits a compact representation of data within a QA system. Some suggestions are made for heuristics which can be used to speed-up the unification algorithm in systems. Author

N74-29546# Battelle-Northwest, Richland, Wash.

USE OF LINEAR PROGRAMMING TO MODEL BUSINESS AND CONSUMER DECISION MAKING RELATED TO ENERGY CONSUMPTION

D. E. Deonigi 1973 32 p refs Presented at the Oper. Res. Soc. of Am., San Diego, 12-14 Nov. 1973 Sponsored by AEC (BNWL-SA-4843; Conf-731130-2) Avail: NTIS HC $3.75

Models that predict the response of business and consumers to changes in energy cost have been made previously, but with today's erratic economy, the models do not apply. Prices are rising at an unprecedented rate and the availability and environmental controls also influence the choice of fuels as well as price. With these factors, the new linear programming was designed to determine the electrical generation supply for the next 50 years taking into account the advent of nuclear power. The model is formulated to simulate a schedule of building power plants that will supply projected energy requirements while also satisfying constraints representing material balances, technological introduction rate constraints, fuel price step functions, committed plant construction, and fuel-processing capacity. NSA

N74-29547# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

NATURAL COMMUNICATION WITH COMPUTERS 4 Quarterly Progress Report, 1 Jan. - 31 Mar. 1974

May 1974 59 p refs (Contract DAHC15-71-C-0088; ARPA Order 1967) (AD-778673; BBN-2822; QPR-14) Avail: NTIS CSCL 09/2

Under this contract, broad based computer science research and development work is performed in areas including: speech understanding systems, speech compression, development of programs and programming aids, techniques for extending computer I/O capabilities, research and development on time sharing systems, and distributed computation. This research program involves the ability to represent knowledge and deal with it in computer oriented terms, requires systems capable of a high degree of man-machine interaction, and draws upon many diverse fields such as linguistics, communications, programming, hardware development, speech recognition, etc. to facilitate fuller use of the enormous potential of natural modes of communication with computers. Author (GRA)

N74-29548# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DESIGN AND SYNTHESIS OF A VECTOR-GRAPHICS SYSTEM M.S. Thesis

Jeri L. Kennedy Mar. 1974 120 p refs (AD-777242; GE/EE/74M-8) Avail: NTIS CSCL 09/2

Cathode-Ray Tube Vector Graphic Systems offer the user rapid interaction with either static or dynamic images. This report divides vector generators into two classes--digital and analog--and gives multiple examples within each class. Comparisons are made and conclusions are drawn concerning the relative merits of each generation method. A complete vector graphic display system is developed based upon the Binary Rate Multiplier method of vector generation. Three system descriptions are offered. They are, hardware, software and state-transition oriented. Each subassembly within the system is completely specified. The techniques used are evaluated via a breadboard model. Actual photographs illustrated important display capabilities. Author (GRA)

N74-29549# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

XYZPLT - A COMPUTER PLOTTING ROUTINE FOR ENGINEERING APPLICATIONS Interim Technical Report, Sep. 1968 - Feb. 1974

Ronald B. Berger and Glen M. Winemiller Feb. 1974 69 p (AD-778845; ASD-TR-73-50) Avail: NTIS CSCL 09/2

The availability of computer plotted output has greatly increased the flexibility and use of automated data reduction programs. These programs can create reproducible high quality plotted output in lieu of less desirable printed output. The plotter's flexibility, however, is directly related to coding complexity in user programs. ZYZPLT, the subject of the report, was created for California Computer Products (CALCOMP) plotting systems as a method of more easily providing plotted output than would otherwise be possible. By functioning as an interface program between the programmer and the plotting software, and as a compromise between total plotter control and total black box usage, XYZPLT provides easy accomplishment of essential options needed for engineering applications. Author (GRA)

N74-29550# Rome Air Development Center, Griffiss AFB, N.Y.
ROME AIR DEVELOPMENT CENTER R AND D PROGRAM IN COMPUTER LANGUAGE CONTROLS AND SOFTWARE ENGINEERING TECHNIQUES
Richard H. Thayer Apr. 1974 23 p refs
(AD-778836; RADC-TR-74-80) Avail: NTIS CSCL 09/2

In the procurement of any large scale automatic data processing system, software development costs the United States Air Force three to five times the cost of hardware. These software costs can be attributed to the sheer magnitude of the labor of coding, the extremely high cost of debugging and verifying programs, a low transferability of computer programs between machines and the high cost of maintaining programs which include the elimination of latent errors. Only through automation of software production can the Air Force hope to control software development. This paper looks at the software production cycle, the present problems associated with it and the USAF R and D program in the development of automated techniques for software production. A final challenge is offered on knotty software R and D problems, that, if solved, could further Computer Technology. (Modified author abstract) GRA

N74-29551# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS AND BASIC STAGES IN THE DESIGNING OF SYSTEMS FOR AUTOMATION OF EXPERIMENTS
V. M. Vegipko 17 Apr. 1974 24 p refs Transl. into ENGLISH from Upravlyayushchie Sistemy Mashiny (USSR), no. 1, Sep. - Oct. 1972 p 71-78
(AD-778518; FTD-MT-24-542-74) Avail: NTIS CSCL 09/2

Systems for automation of experiments are analyzed and problems occurring in the design of such systems are discussed. E.J.O.

N74-29552# University of Southern Calif., Los Angeles. Image Processing Inst.
IMAGE PROCESSING RESEARCH Technical Semiannual Report, 1 Sep. 1973 - 28 Feb. 1974
William K. Pratt 31 Mar. 1974 160 p refs
(Contract F08606-72-C-0008; ARPA Order 1706)
(AD-779332; USCIPI-530) Avail: NTIS CSCL 09/2

The report summarizes the image processing research activities performed by the University of Southern California during the period of 1 February 1973 to 28 February 1974 under contract. Research is oriented toward digital processing and transmission systems. Five task areas are reported on: (1) Image Coding Projects; the investigation of digital bandwidth reduction coding methods; (2) Image Restoration and Enhancement: the improvement of image fidelity and presentation format; (3) Image Data Extraction Projects; the recognition of objects within pictures and quantitative measurement of image features; (4) Image Analysis Projects; the development of quantitative measures of image quality and analytic representation; (5) Image Processing Support Projects; development of image processing hardware and software support systems. (Modified author abstract) GRA

N74-29553# Defense Documentation Center, Alexandria, Va.
ELECTRONIC DATA STORAGE DEVICES Report Bibliography, Jan. 1963 - Aug. 1973
May 1974 453 p refs
(AD-779600; DDC-TAS-74-19) Avail: NTIS CSCL 09/2

The bibliography is a selection of 330 unclassified and unlimited distribution references on Electronic Data Storage Devices. These references are studies and analyses relating to design, configuration, power units, electronic equipment, control systems, display systems, maintainability and performance effectiveness of electronic data storage devices. Four computer generated indexes are included. GRA

N74-29554# Massachusetts Computer Associates, Inc., Wakefield.
DEVELOPMENT OF THEORETICAL FOUNDATIONS FOR DESCRIPTION AND ANALYSIS OF DISCRETE INFORMATION SYSTEMS. VOLUME 1: SEMANTICS Final Report
20 May 1974 66 p Sponsored in part by ARPA
(AD-779257; CADD-7405-2011-Vol-1) Avail: NTIS CSCL 09/2

Contents: Communication mechanics (Parts, Values, Motion and propagation, The motion of parts and values); Nets, time and space (Cells and boundaries, Full and empty space and time, One-directional motion). GRA

N74-29555# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
A SPEECH SAMPLING INTERFACE FOR THE PDP-8/E COMPUTER Interim Report
Harold K. Knudsen Nov. 1973 20 p refs
(Grant AF-AFOSR-2178-72; AF Proj. 9769)
(AD-778441; EE-220(73)AFOSR-222-3; AFOSR-74-0624TR) Avail: NTIS CSCL 09/2

The document reports on work done on an analog data acquisition system for speech input to the PDP 8/E computer during Summer 1973. The data acquisition system was designed to provide a flexible speech input system with ties to both a larger computer (the IBM 1620), and a video display (the DEC VT8E). This report describes the use of the analog data acquisition system, which is named the CLIPS A/D Conversion System. The report also describes the use of a Speech Sampling and Display Program which makes use of the data acquisition system and the video display. Author (GRA)

N74-29790* Kanner (Leo) Associates, Redwood City, Calif.
INDUSTRIAL REALIZATION OF A DIRECT FOURIER TRANSFORM IN AUTOMATED EXPERIMENTAL DATA PROCESSING SYSTEMS
G. S. Lyubashevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 13-16 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 15-17 (For availability see N74-29785 19-15)
CSCL 09B

N74-29865* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF FLUCTUATIONS IN ANGULAR VELOCITY IN MAGNETIC MEMORY DEVICES
Yu. A. Meshkis and Z. Yu. Potsyus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 283-284 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 254 (For availability see N74-29785 19-15)
CSCL 09B

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-29556* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
DIGITAL SERVO CONTROLLER Patent
Frank Byrne, inventor (to NASA) Issued 30 Jul. 1974 7 p Filed 28 Jun. 1973 Supersedes N73-27153 (11 - 18, p 2122)
(NASA-Case-KSC-10769-1; US-Patent-3,826,964;

US-Patent-Appl-SN-374583; US-Patent-Class-318-602; US-Patent-Class-318-603; US-Patent-Class-318-664) Avail: US Patent Office CSCL 09A

A system, for generating a signal to control the rotation of a shaft supporting an antenna so that the antenna is rotated the shortest angular distance from a present angular position to a new desired angular position, was described. The system comprises a shaft encoder which generates a digital encoder signal indicating the present position of the shaft. A command signal is compared with the encoder signal to produce an analog signal for rotating the antenna. An error signal is produced for controlling the direction of rotation of the antenna.

Official Gazette of the U.S. Patent Office

N74-29557# Technische Hochschule, Hanover (West Germany).
ON THE EFFECT OF FIELD STRENGTH ON THE CONDUCTION MECHANISM IN POLYEHTYLENE UNDER DIRECT AND ALTERNATING VOLTAGES Ph.D Thesis [UEBER DEN EINFLUSS DER FELDSTAERKE AUF DEN LEITUNGSMECHANISMUS IN POLYAETHYLEN BEI GLEICH-UND WECHSELSPANNUNG]
Rainer VonOlshausen 1973 162 p refs In GERMAN
Avail: NTIS HC $11.25

The dependence of direct current conductivity and dielectric loss factor at 50 Hz on field strength is studied on polyethylene plates. A modified band model is used to interprete observed measurement parameters, and a formula is developed that relates loss factor and direct current conductivity to field strength and temperature. Transl. by G.G.

N74-29558# Technische Universitaet, Brunswick (West Germany).
METALLIC FOIL USED AS CIRCUIT BREAKER FOR FAST AND HIGH CURRENT COMMUTATION FROM INDUCTIVE STORAGE Ph.D. Thesis
Guenter Schenk 1972 139 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC $10.00

A description is given of an exploding foil switch used for fast energy transfer from an inductive storage to an inductive-resistive load. Experiments are presented where an aluminum foil is heated by discharging a condenser battery and causing a current in the - intermediate storage - inductance and the aluminum foil. The current rises up to 1 million A in a few microseconds and finally the foil resistance increases more than two orders of magnitude, causing the current suppression. In this manner one commutates the current into the load in less than one microsecond. The fast heating of the aluminum foil up to explosion can be determined by the action integral. Author

N74-29559# Technischen Universitaet, Munich (West Germany).
PARAMETRIC OSCILLATIONS IN HIGH FREQUENCY TRANSISTOR POWER AMPLIFIERS CAUSED BY NONLINEAR REACTANCE Ph.D. Thesis [PARASITAERE SCHWINGUNGEN IN HOCHFREQUENZ TRANSISTORLEISTUNGSVERSTAERKERN HERVORGERUFEN DURCH NICHTLINEARE REAKTANZ]
Dieter R. Lohrmann 1 Feb. 1973 23 p refs In GERMAN
Avail: NTIS HC $4.25

Parametric oscillations in high frequency transistors amplifiers are caused by nonlinear capacity surges at high signal amplitudes. These effects are most pronounced in small transistor and circuit losses, at increased voltages. Transl. by G.G.

N74-29560# Technischen Universitaet, Hanover (West Germany).
BANDWIDTH OPTIMIZATION FOR NEGATIVE FEEDBACK NONRECIPROCAL MIXING CIRCUIT AMPLIFIERS WITHOUT CIRCULATOR Ph.D. Thesis [DIE OPTIMIERUNG DER BANDBREITE GEGENGEKOPPELTER NICHTREZIPROKER PARAMETRISCHER MISCHERKETTENVERSTAERKER OHNE ZIRKULATOR]
Helmar Fischer 1973 169 p refs In GERMAN
Avail: NTIS HC $11.50

Nonreciprocal parametric linear amplifiers are discussed that are formed by relay circuits for upward and a downward mixer. Negative feedback increases bandwidth of the system and improves its noise properties. Effects of the individual circuit parameters on bandwidth are evaluated and it is shown that inclusion of diode parallel resonance in the feedback circuit, the use of transforming circuit loops in the feedback circuit plane, and optimal distribution of additional damping in subsidiary frequencies enlarges the bandwidth. Transl. by G.G.

N74-29561# Technische Universitaet, Brunswick (West Germany).
OPERATIONAL BEHAVIOR OF ASYNCHRONOUS MACHINES DURING CONSTANT VOLTAGE, ALTERNATING CURRENT FEED CONSIDERING SATURATION Ph.D. Thesis [BETRIEBSVERHALTEN VON KURZSCHLUSSLAEUFERMASCHINEN BEI WECHSELRICHTERSPEISUNG MIT KONSTANTER SPANNUNG UNTER BERUECKSICHTIGUNG DER SAETTIGUNG]
Eberhard Heers 1973 139 p refs In GERMAN
Avail: NTIS HC $10.00

The static and dynamic behavior of an inverted converter controlled asynchronous machine is analyzed for a two-axle representation by solving the differential equation system through the Laplace transformation. The thyristors of a six pulse inverted converter are considered ideal switches and constant direct voltage distribution is used to calculate currents flows. It is shown that at large rotational speeds rotor control is dependent on armature current and rotor frequency, at low speeds only on rotor frequency. Calculations on the dynamic behavior at constant rotor frequencies prove the marked effect of the thyristorized inverted converter on current cut-off angles above 60 deg to a null value. Transl. by G.G.

N74-29562*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
LIGHTWEIGHT 3.66-METER-DIAMETER CONICAL MESH ANTENNA REFLECTOR
Donald M. Moore 15 Jun. 1974 47 p refs
(Contract NAS7-100)
(NASA-CR-139219; JPL-TM-33-685) Avail: NTIS HC $5.50 CSCL 09E

A description is given of a 3.66 m diameter nonfurlable conical mesh antenna incorporating the line source feed principle recently developed. The weight of the mesh reflector and its support structure is 162 N. An area weighted RMS surface deviation of 0.28 mm was obtained. The RF performance measurements show a gain of 48.3 db at 8.448 GHz corresponding to an efficiency of 66%. During the design and development of this antenna, the technology for fabricating the large conical membranes of knitted mesh was developed. As part of this technology a FORTRAN computer program, COMESH, was developed which permits the user to predict the surface accuracy of a stretched conical membrane. Author

N74-29563*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SIMPLIFIED CUT CORE INDUCTOR DESIGN
W. T. McLyman 1 Jul. 1974 131 p refs
(Contract NAS7-100)
(NASA-CR-139361; JPL-TM-33-697) Avail: NTIS HC $9.75 CSCL 09E

Although filter inductor designers have routinely tended to specify molypermalloy powder cores for use in high frequency power converters and pulse-width modulated switching regulators, there are significant advantages in specifying C cores and cut toroids fabricated from grain oriented silicon steels which should not be overlooked. Such steel cores can develop flux densities of 1.6 tesla, with useful linearity to 1.2 tesla, whereas molypermalloy cores carrying d.c. current have useful flux dendity capabilities only to about 0.3 tesla. The use of silicon steel cores thus makes it possible to design more compact cores, and therefore inductors of reduced volume, or conversely to provide greater load capacity in inductors of a given volume. Information is available which makes it possible to obtain quick and close approximations of significant parameters such as size, weight and temperature rise for silicon steel cores for breadboarding. Graphs, nomographs and tables are presented for this purpose, but more complete mathematical derivations of some of the important parameters are also included for a more rigorous treatment. Author

N74-29564# Toulouse Univ. (France).
CONTRIBUTION OF THE STUDY OF DIRECT CURRENT CONVERTERS AND ALTERNATE CURRENT TRANSISTORS

Ph.D. Thesis [CONTRIBUTION A L'ETUDE DES CONVERTISSEURS CONTINU-CONTINU ET ALTERNATIF-CONTINU A TRANSISTORS]
Henri Cammas 1973 176 p refs In FRENCH
Avail: NTIS HC $12.00

Problems concerning electric energy distribution and control in feedback regulated converter systems are discussed as well as problems with alternate transistors. Converter and transistor structures, characteristics, and power sources were examined with emphasis on the flyback configuration of alternate current sources. Power output of the equipment, as influenced by modulation, and methods by which modulation may be controlled are given. Transl. by E.H.W.

N74-29565# Toulouse Univ. (France).
CONTRIBUTION OF THE STUDY OF METAL-SILICON CONTACT: ELECTRIC HYSTERESIS Ph.D. Thesis [CONTRIBUTION A L'ETUDE DU CONTACT METALSILICIUM: L'HYSTERESIS ELECTRIQUE]
Claude Flassayer 29 Oct. 1973 106 p refs In FRENCH
Avail: NTIS HC $8.50

The electrical properties of Schottky diodes and general methods of characterizing them are given. Special attention was given to electrical instability as caused by different avalanche zones and inverse polarization. Transl. by E.H.W.

N74-29566# Technische Hogeschool, Eindhoven (Netherlands).
NOISE IN IMPATT-DIODE OSCILLATORS Ph.D. Thesis
Jasper Jan Goedbloed [1973] 130 p refs
Avail: NTIS HC $9.50

A numerical analysis of the performance of IMPATT-diode oscillators is presented. The subjects discussed are: (1) the IMPATT-diode model, (2) the theory of the noise-free IMPATT diode, (3) noise of the nonoscillating diodes, (4) oscillator noise, (5) linear theory of IMPATT diode oscillator noise, and (6) nonlinear IMPATT diode oscillator noise. Author

N74-29567# Technische Hochschule, Hanover (West Germany).
INTERRUPTION OF SMOOTH RUNNING ALTERNATING CURRENT ASYNCHRONOUS MACHINES CAUSED BY ELECTROMAGNETIC INDUCTION Ph.D. Thesis [UEBER DIE STOERUNG DER LAUFRUHE VON DREHSTROM-ASYNCHRONMASCHINEN INFOLGE ELEKTROMAGNETISCHER ANFACHUNGEN]
Helmut Haase 1973 55 p refs In GERMAN
Avail: NTIS HC $5.75

Running disturbances in double squirrel cage motors are caused by air gap induction waves responding with a certain magnetic radial propelling force to self oscillations in the rotor. Each of these radial propelling forces is composed by a central rotor proportional control component and a velocity proportional component combined in the electromagnetic damping effect. The sum of mechanical and electromagnetic yield values determines rotor eigenfrequencies. Formulas are developed for numerical calculations on the electromagnetic yield and damping values, and it is shown that the grooving mechanism of the shaft and the rotor grooving number decide whether electromagnetic triggered rotary eigenoscillations develop. Transl. by G.G.

N74-29568# Technische Hogeschool, Eindhoven (Netherlands).
A CONTRIBUTION TO THE DEVELOPMENT OF STEPPING MOTORS Ph.D. Thesis
A. J. C. Bakhuizen 5 Oct. 1973 279 p refs
Avail: NTIS HC $17.00

The development of a special purpose servomotor closely related to stepping motors is reported. The multitude of types of stepping motors is reduced to three basic two-pole models, which are accessible to analysis and suitable for making a survey of the essential properties. This leads to the introduction of the basic variable reluctance motor, the basic permanent magnet motor and the basic hybrid motor. It is shown how from these basic models most industrial types have been developed. A method is detailed for the calculation of the quasistatic torque that can be expected from each of the basic motors in optimum conditions. For the three types, provided with rotors of equivalent size, the torques are calculated and compared with a view to possible preference. The method of calculation is extended to multi-pole motors, and eventually a dimensional analysis is developed. Author

N74-29569# Technische Hogeschool, Eindhoven (Netherlands).
NOISE IN IMPATT-DIODE OSCILLATORS
Jasper Jan Goedbloed 6 Nov. 1973 131 p refs
Avail: NTIS HC $9.75

A diode model is introduced in order to analyze oscillator noise by first considering the small signal and large signal behavior of a noise free IMPATT-diode. The noise properties of the non-oscillating diode are discussed in terms of the response time of the avalanche process which governs the internal noise of the diode. The oscillator noise measuring equipment is described and the basic idea that the output signal consists of narrow-band amplified noise is worked out and checked experimentally. Up-converted and down-converted noise was also studied. Author

N74-29570*# TRW Systems Group, Redondo Beach, Calif.
DESIGN, DEVELOPMENT, AND FABRICATION OF A ELECTRONIC ANALOG MICROMINIATURIZED ELECTRONIC ANALOG SIGNAL TO DISCRETE TIME INTERVAL CONVERTER
A. D. Schoenfeld and K. K. Schuegraf Aug. 1973 78 p refs (Contract NAS3-16797)
(NASA-CR-120905) Avail: NTIS HC $7.00 CSCL 09E

The microminiaturization of an electronic analog signal to discrete time interval converter is presented. Discrete components and integrated circuits comprising the converter were assembled on a thin-film ceramic substrate containing nichrome resistors with gold interconnections. The finished assembly is enclosed in a flat package measuring 3.30 by 4.57 centimeters. The module can be used whenever conversion of analog to digital signals is required, in particular for the purpose of regulation by means of pulse modulation. In conjunction with a precision voltage reference, the module was applied to control the duty cycle of a switching regulator within a temperature range of -55 C to +125 C, and an input voltage range of 10V to 35V. The output-voltage variation was less than + or - 300 parts per million, i.e., less than + or - 3mV for a 10V output. Author

N74-29571*# TRW Systems Group, Redondo Beach, Calif.
THE APPLICATION OF THE ANALOG SIGNAL TO DISCRETE TIME INTERVAL CONVERTER TO THE SIGNAL CONDITIONER POWER SUPPLIES
A. D. Schoenfeld and Y. Yu Aug. 1973 34 p refs (Contract NAS3-16797)
(NASA-CR-120906) Avail: NTIS HC $4.75 CSCL 09C

The Analog Signal to Discrete Time Interval Converter microminiaturized module was utilized to control the signal conditioner power supplies. The multi-loop control provides outstanding static and dynamic performance characteristics, exceeding those generally associated with single-loop regulators. Eight converter boards, each containing three independent dc to dc converter, were built, tested, and delivered. Author

N74-29572*# Ohio State Univ., Columbus.
MUTUAL IMPEDANCE OF NONPLANAR-SKEW SINUSOIDAL DIPOLES
Jack H. Richmond and N. Hugh Geary Aug. 1974 13 p refs (Grant NGL-36-008-138)
(NASA-CR-138310; ESL-2902-18) Avail: NTIS HC$4.00 CSCL 09C

The mutual impedance of nonplanar-skew sinusoidal dipoles is presented as a summation of several exponential integrals with complex arguments. Mathematical models are developed to show the near-zone field of the sinusoidal dipole. The mutual impedance of coupled dipoles is expressed as the sum of four monopole-mobopole impedances tc simplify the analysis procedure. The subroutines for solving the parameters of the dipoles are discussed. Author

N74-29573# Air Force Systems Command, Wright-Patterson AFB, Ohio.
PRINCIPLES OF THE CONSTRUCTION OF MULTISTABLE ELEMENTS USING NEURISTORS Foreign Technology Div.
V. G. Filkov 23 Apr. 1974 11 p refs Transl. into ENGLISH of the Mono. "Mnogoustoichivye Elementy i ikh Primenenie"

(USSR), 1971 p 209-215
(FTD Proj. T74-05-12)
(AD-779663; FTD-HT-23-1018-74) Avail: NTIS CSCL 09/5

The article examines the possibilities of microminiaturization of dynamic multistable elements on a neuristor base. GRA

N74-29574*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
MICROSTRIP ANTENNA STUDY FOR PIONEER SATURN/URANUS ATMOSPHERE ENTRY PROBE
E. A. Kuhlman May 1974 69 p refs
(Contract NAS2-7328)
(NASA-CR-137513) Avail: NTIS HC $6.50 CSCL 09E

The design parameters of a microstrip antenna were studied to determine its performance characteristics as affected by an atmospheric entry probe environment. The technical literature was reviewed to identify the known design and performance characteristics. These data were used to evaluate the expected effects of mission environments on the microstrip antenna design proposed for the Saturn/Uranus Atmospheric Entry Probe (SAEP). Radiation patterns and VSWR measurements were made to evaluate the performance in the SAEP thermal environment. Results of the literature search and pattern tests confirm that the microstrip antenna is a good choice as a transmitting antenna on the SAEP. The microstrip antenna is efficient, compact, and well suited to a space environment. The pattern can be controlled with a minimum beamwidth of 60 degrees (air substrate; e.g., honeycomb structure) and a maximum on the order of 100 degrees with higher dielectric constant substrates. The power handling capacity is good and can be improved by covering the antenna with a dielectric cover. Author

N74-29575*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HORN ANTENNA HAVING V-SHAPED CORRUGATED SLOTS Patent Application
Carl A. Mentzer (Ohio State Univ.) and Leon Peters, Jr., inventors (to NASA) (Ohio State Univ.) Issued 24 Jul. 1974 8 p
(Contract NASw-2501)
(NASA-Case-LAR-11112-1; US-Patent-Appl-SN-491419) Avail: NTIS HC $4.00 CSCL 09E

The development of a corrugated horn antenna in which the corrugated surfaces of the antenna are formed by V-shaped slots was reported. The depth of the slots is between 0.3125 and 0.625 wavelengths. For this range of depths the surface impedance is capacitive and operates in a cut-off mode. The V-shaped corrugated slots are more easily machined than previous slots and the resulting antenna is readily adaptable to unfurlable antennas for space applications. NASA

N74-29576*# National Aeronautics and Space Administration, Washington, D.C.
CABLES AND CONNECTORS: A COMPILATION Technology Utilization
[1974] 22 p
(NASA-SP-5936(02)) Avail: NTIS HC $1.00 CSCL 09A

A compilation is presented that reflects the uses, adaptation, and maintenance plus service, that are innovations derived from problem solutions in the space R and D programs, both in house and by NASA and AEC contractors. Data cover: (1) technology revelant to the employment of flat conductor cables and their adaptation to and within conventional systems, (2) connectors and various adaptations, and (3) maintenance and service technology, and shop hints useful in the installation and care of cables and connectors. Author

N74-29577*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTEGRATED STRUCTURE VACUUM TUBE Patent Application
John Dimeff and William J. Kerwin, inventors (to NASA) Issued 24 Jul. 1974 18 p
(NASA-Case-ARC-10445-1; US-Patent-Appl-SN-491418) Avail: NTIS HC $4.00 CSCL 09A

High efficiency, multi-dimensional thin film vacuum tubes suitable for use in high temperature, high radiation environments are described. The tubes are fabricated by placing, as by photolithographic techniques, such as are used in solid state integrated circuits, thin film electrode members in selected arrays on facing interior wall surfaces of an alumina substrate envelope. Cathode members are formed using thin films of triple carbonate. The photoresist used in photolithography aids in activation of the cathodes by carbonizing and reacting with the reduced carbonates when heated in vacuum during forming. The finely powdered triple carbonate is mixed with the photoresist used to delineate the cathode locations in the conventional solid state photolithographic manner. Upon high temperature forming (1000 C) the barium, etc. is formed at the surface. Anode and grid members are formed using thin films of refractory metal. NASA

N74-29578*# General Electric Co., Schenectady, N.Y. Research and Development Center.
DEVELOPMENT AND FABRICATION OF IMPROVED SCHOTTKY POWER DIODES Interim Report
L. F. Cordes, M. Garfinkel, and E. A. Taft [1974] 69 p refs
(Contract NAS3-116749)
(NASA-CR-134624; SRD-74-024) Avail: NTIS HC $6.50 CSCL 09A

Reproducible methods for the fabrication of silicon Schottky diodes were developed for the metals; tungsten, aluminum, conventional platinum silicide, and low temperature platinum silicide. Barrier heights and barrier lowering were measured permitting the accurate prediction of ideal forward and reverse diode performance. Processing procedures were developed which permit the fabrication of large area mesa-geometry power Schottky diodes with forward and reverse characteristics that approach theoretical values. Author

N74-29579*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DESIGN PARAMETERS FOR TOROIDAL AND BOBBIN MAGNETICS
W. T. McLyman 1 Jul. 1974 139 p refs Revised
(Contract NAS7-100)
(NASA-CR-139248; JPL-TM-33-651-Rev-1) Avail: NTIS HC $10.00 CSCL 09E

The adoption by NASA of the metric system for dimensioning to replace long-used English units imposes a requirement on the U.S. transformer designer to convert from the familiar units to the less familiar metric equivalents. Material is presented to assist in that transition in the field of transformer design and fabrication. The conversion data makes it possible for the designer to obtain a fast and close approximation of significant parameters such as size, weight, and temperature rise. Nomographs are included to provide a close approximation for breadboarding purposes. For greater convenience, derivations of some of the parameters are also presented. Author

N74-29580# Oak Ridge National Lab., Tenn.
DIAMAGNETIC EFFECTS IN A TAPE WOUND SUPERCONDUCTING SOLENOID
P. L. Walstrom Jan. 1974 12 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4456) Avail: NTIS HC $3.00

The effect of diamagnetic shielding currents on the magnetic field in a tape-wound superconducting solenoid is calculated on the basis of the isothermal critical state model and compared with measured values. The calculation is found to be in reasonable agreement with the data. Additional calculations showing the effect of the tape width on the diamagnetic correction to the central field are presented. Author (NSA)

N74-29581# Northrop Corp., Palos Verdes Estates, Calif. Electronics Div.
DIGITAL ADDRESS THIN DISPLAY TUBE Quarterly Report, 15 Jun. - 15 Sep. 1973
Walter F. Goede Mar. 1974 21 p
(Contract DAAB07-72-C-0076; DA Proj. 1S6-62705-A-055) (AD-778771; NORT-72-280-6; ECOM-0076-6-72; QR-6) Avail: NTIS CSCL 09/5

The report describes the progress which occurred during the sixth quarter of a research and development contract to develop a 512 x 512 resolution-element display with a resolution of 55 holes-per-inch. This digitally addressed thin display-tube is being developed to evaluate and demonstrate the feasibility of using this display concept to meet Army requirements for a

computer-output display. During the sixth quarter, work continued in the plate-fabrication area. Parts for both switching-stacks were completed; however, some rework of one of the switching-plates may be required. Major progress occurred in the tube-development area. (Modified author abstract) GRA

N74-29582# Ohio State Univ., Columbus. ElectroScience Lab.
STRIP ANTENNAS IN OR ON AN ELECTRICALLY THIN DIELECTRIC SLAB
Edward H. Newman Apr. 1974 38 p refs
(Contract DAAG39-72-C-0041; HDL Proj. 117215)
(AD-777509; ESL-3281-4; HDL-041-2) Avail: NTIS CSCL 09/5

The problem considered is an electrically thin strip antenna in or on an electrically thin dielectric slab. A moment method solution is presented which has the advantage that the number of unknowns is a function of the wire length, and not of the dielectric slab size. Numerical calculations and experimental verification are shown for a strip dipole in the center and on the surface of a dielectric slab. Author (GRA)

N74-29583# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPECIAL FEATURES OF THE CALCULATION OF THE ELECTROMAGNETIC SHIELDING OF METER-WAVE GENERATORS
N. B. Maksimenko, N. N. Gonchareva, A. Ya. Severinskii, and A. S. Teslenko 11 Apr. 1974 9 p refs Transl. into ENGLISH from Radiotekhnika (USSR), no. 24, 1973 p 97-99
(AD-778503; FTD-HT-23-1719-74) Avail: NTIS CSCL 09/1

Presented is the calculation of the effectiveness of a solid metal screen with slits with a wall thickness much greater than the depth of penetration of the field. In this case, the effectiveness of the shield is determined by the slit alone. For simplification, the article considers a spherical shield with a slit much smaller than the dimensions of the shield, which leads to weak diffraction phenomena. The source of the field--an elementary electric vibrator--is placed in the center of the sphere, and the coefficient of reduction of the field outside the sphere is determined. GRA

N74-29584# Texas Instruments, Inc., Dallas.
PULSE POWER STUDIES OF HARDENED MICROCIRCUITS Final Report, Nov. 1971 - May 1973
W. F. Kennan and D. M. Smith Dec. 1973 83 p refs
(Contract F30602-72-C-0077)
(AD-779666; TI-03-73-57; RADC-TR-73-367) Avail: NTIS CSCL 09/5

A study was made of the effects of large amplitude transient pulses on radiation tolerant integrated circuits. Two distinct burnout mechanisms exist, diode failure and resistor burnout. Both mechanisms were investigated independently by test structures to measure the influence of processing variations on the failure levels. (Modified author abstract) GRA

N74-29585# EIMAC, San Carlos, Calif.
DEVELOPMENT OF A VERSATILE LINEAR GRIDDED-TUBE/CAVITY UHF POWER AMPLIFIER Semiannual Report, 1 Oct. 1973 - 1 Apr. 1974
15 Apr. 1974 26 p
(Contract N000123-74-C-0309)
(AD-779479; EIMAC-TR-74-1) Avail: NTIS CSCL 09/5

Five EIMAC type 8938 or modifications thereof were fabricated and tested over the frequency range 225 to 400 MHz. Tube modifications included (a) application of a special high temperature Pyrogrid grid coating, (b) application of high conductivity materials to critical parts of the tube configuration in order to reduce RF losses and provide improved thermal management, (c) the application of a coated particle cathode emitter material. Two different tunable cavities were fabricated during this period. The first, a narrow band cavity, was built in order to evaluate comparative performance of tubes (8938) and the modifications applied to those tubes. The other tunable cavity is a double-tuned iris coupled configuration and is the prototype wide band cavity for this program. Author (GRA)

N74-29586# Harris-Intertype Corp., Melbourne, Fla. Radiation Systems Div.
RECURSIVE ALGORITHMS FOR ADAPTIVE ARRAY ANTENNAS Final Report, Jun. 1972 - Jun. 1973
Charles A. Baird, Jr. Mar. 1974 152 p refs
(Contract F30602-72-C-0499)
(AD-778947; RADC-TR-74-46) Avail: NTIS CSCL 09/5

The techniques define digital control algorithms based on least squares estimation methods to adjust the parameters of a multichannel array filter to perform automatic null steering. The algorithms are designed to converge to the optimal filter parameters (array weights) defined by the solution of a set of linear algebraic equations (a Wiener-Hopf type equation), and their relationship to Kalman filtering methods are discussed. Both convergence analysis and simulations demonstrate rapid convergence behavior; however, accurate computations appear to be required for some cases due to ill-conditioning of these equations. The basic recursive algorithm is derived for use with desired signal approximations, and several techniques for signal acquisition are discussed and simulated. Also, alternative algorithm forms based on using desired signal direction of arrival information are developed and simulated. Finally, the performance of the basic recursive algorithm is compared, through simulations, to the gradient (LMS) and random search methods. (Modified author abstract) GRA

N74-29587# General Electric Co., Syracuse, N.Y. Heavy Military Electronic Systems.
ZOOM FEED TECHNIQUE STUDY Final Report, Nov. 1972 - Nov. 1973
Thomas A. Manwarren and Armand R. Minuti Mar. 1974 111 p
(Contract F30602-73-C-0059)
(AD-778439; RADC-TR-74-56) Avail: NTIS CSCL 09/5

The final report covers the period 10 November 1972 through 10 November 1973. During that period several tasks were accomplished, all of which pertain to large-element, limited-scan phased arrays. The first task was development of a feed system concept for multiple-ring planar arrays in which the sum and difference channels can be separately optimized in circularly-symmetrical aperture modes, and duplexing can be accomplished using the elemental phase shifters. The second task was reduction of this concept to practice in a single ring of 16 elements, and the third task was development of a circularly-symmetrical, optimum-difference pattern in which maximum sensitivity is obtained for a given side lobe level. The synthesized distribution is actually a circular version of the Bayliss aperture weighting. Author (GRA)

N74-29588# Stanford Research Inst., Menlo Park, Calif.
NEW MICROWAVE-SURFACE-ACOUSTIC-WAVE TRANSDUCER Final Report, 7 Nov. 1972 - 6 Sep. 1973
Robert E. Lee and Eugene R. Westerberg Mar. 1974 80 p refs
(Contract F30602-73-C-0069; SRI Proj. 2290)
(AD-779699; RADC-TR-74-74-55) Avail: NTIS CSCL 09/1

The report describes the development of a novel electron-beam image-projection exposure apparatus termed the (slit-lens) system that has been used to fabricate high-resolution patterns for use as microwave-frequency surface-acoustic-wave transducers. Further research efforts include the development of ancillary techniques for making: (1) the intermediate electron-transmission masks required by the slit-lens system, and (2) the thin films necessary for production of metallic patterns on piezoelectric substrates. Various high-frequency surface-wave-transducer structures have been fabricated and electrically tested. The new (hybrid-grating) transducer has been produced and its performance compared to that of conventional interdigital transducers (at microwave frequencies). A theoretical analysis of the hybrid and grating transducer has been carried out and the input impedance of these transducers has been compared with that of a conventional interdigital structure. Particular attention was paid to the effect of parasitic capacitance on the performance of the various transducers. (Modified author abstract) GRA

N74-29589# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SYNTHESIS OF A STRIP SLOT ANTENNA WITH A TRAVELING-WAVE DRIVE
V. A. Melnikov 19 Apr. 1974 10 p refs Transl. into ENGLISH

from Novye Razrabotki Elementov Radiotekhn. Ustroistv. Resp. Mezhduved. Sbornik (USSR), no. 1, 1972 p 150-154
(AD-779618; FTD-HT-23-1443-74) Avail: NTIS CSCL 09/5
Presents mathematical analysis of the antenna. GRA

N74-29590# Hughes Aircraft Co., Culver City, Calif. Aerospace Group.
HEMISPHERICALLY SCANNED ARRAYS
Alfred T. Villeneuve, Marvin C. Behnke, and Wolfgang H. Kummer Dec. 1973 36 p refs
(Contract F19628-72-C-0145; AF Proj. 4600)
(AD-779695; HAC-Ref-C5350; AFCRL-TR-74-0084) Avail: NTIS CSCL 09/5

The report contains analyses of the radiation characteristics of grounded dielectric slabs fed by slots in a groundplane. It also contains experimental patterns of such configurations. In addition, measured patterns of slots with parasitic radiating elements, and of combinations of slots, surface wave structures and parasitic elements, are included. It is shown that significant improvement of radiation at the horizon can be obtained in the E-plane and that significant broadening of the pattern can be obtained in the H-plane. Patterns of a linear array of slots in a groundplane with curved extensions, electronically scanned in the E-plane show that significant improvement in radiation at endfire can be obtained using a surface wave structure. Recommendations for further study are included. Author (GRA)

N74-29591# Army Electronics Command, Fort Monmouth, N.J.
ANTENNA AND INSTRUMENT SUPPORTS INVESTIGATION-GUY CONTROL TECHNIQUES AND DEVICES Research and Development Technical Report
Archie M. Kumasaka May 1974 18 p
(DA Proj. 1S7-62701-A-173)
(AD-779396; ECOM-4219) Avail: NTIS CSCL 09/5

The report covers the development of an all mechanical device for controlling guy cables as vertically erected masts are raised and lowered. Controlling the guy cables is essential in maintaining verticality of the masts when subjected to wind loads or other horizontal force components in order to assure safe operation during erection and retraction phases. The device developed under this program employs the use of Weston brakes to control the guy cables, permitting a vertical erection or retraction while under the full control of the mast launcher operator. Heretofore, automatic guy wire control devices required the availability of electric power, or in a manual control technique the employment of additional personnel at each guy control cable to safely erect and retract masts with heavy antenna payloads to heights greater than 50 feet in winds of between 15 and 25 mph. In its present prototype stage, the Weston brake control device with mast AB-864 has operated successfully during the erection of a 90 pound antenna to a 50 foot height in a simulated 25 mph wind condition. This device should be capable of operating with any vertically erected type of mast.
Author (GRA)

N74-29592# Illinois Univ., Urbana. Coordinated Science Lab.
SURFACE ACOUSTIC WAVE CONVOLUTION ON PZT USING INTERDIGITALLY POLED, CURVED TRANSDUCERS
John Thomas Gasner Mar. 1974 36 p refs
(Contract DAAB07-72-C-0259)
(AD-779313; R-643; UILU-ENG-74-2207) Avail: NTIS CSCL 09/1

The power gains of eight convolvers were compared. Curved or focused input transducers, thinner samples on EC-64 PZT, and dc bias on the output plate gave larger power gains compared to the conventional devices on EC-69 PZT and barium titanate. An overall power gain of -50 db at one watt input power was realized with a convolver using curved transducers on a 0.23 cm EC-64 PZT substrate. This is comparable to typical power gains of -30 db by using a silicon-lithium niobate structure.
Author (GRA)

N74-29593# Cincinnati Electronics Corp., Ohio.
ELECTRONICALLY CONTROLLED FILTERS AND MULTICOUPLERS Interim Report, 1 Jul. 1973 - 1 Mar. 1974
C. M. Morris and R. L. Martinet May 1974 38 p
(Contract DAAB07-73-C-0218)
(AD-779384; Rept-80045-URC-88/374; ECOM-0218-I-73)
Avail: NTIS CSCL 09/5

The report describes the effort completed during the first half of the program to develop electronically controlled filters and multicouplers. The major characteristic of this program is the electronically tunable feature of the filter. Other characteristics of the filter are: an insertion loss of 3 db or better, and the selectivity 10 percent removed from the center frequency. The multicoupler has the feature that two or more transceivers will be able to operate from one antenna. The multicoupler consists of two electronically tunable filters and a hybrid matching network. The report also describes the development of the optimum filter arrangement on the frequency range from 30 to 80 MHz. The design and production of the associated control circuitry for the filter system was also accomplished.
Author (GRA)

N74-29594# Dayton Univ. Research Inst., Ohio.
RESEARCH TO INVESTIGATE THE AGING CHARACTERISTICS OF SAMARIUM COBALT MAGNETS Final Report, 1 Jul. - 14 Dec. 1973
Herbert F. Mildrum and Karl J. Strnat Mar. 1974 113 p refs
(Contract F33615-72-C-1795; AF Proj. 7367)
(AD-779033; UDRI-TR-74-18; AFML-TR-74-50) Avail: NTIS CSCL 09/1

The objective of the work under this contract was the characterization of commercially produced, sintered $SmCo_5$ magnets for various engineering applications. Of particular interest was the long-term stability of selected magnetic properties under environmental influences which simulate the operating conditions of the magnets in devices such as microwave tubes and rotating electrical machines. The research investigations into the aging characteristics of samarium-cobalt magnets were formulated to provide objective information on the sensitivity of the magnetic properties to: (1) variables in the basic magnet manufacturing processes; (2) storage under varying conditions; (3) processing of the magnets into usable configurations; (4) usage under various adverse thermal, mechanical and demagnetizing loads representative of the environmental conditions likely to be encountered by the magnets in device applications. GRA

N74-29595# Aerospace Corp., San Bernardino, Calif. Technology Div.
SPACE CHARGE LIMITING FROM BLACKBODY RADIATION Interim Report, Mar. - May 1973
Gerald G. Comisar 14 May 1974 42 p refs
(Contract F04701-73-C-0074)
(AD-779680; TR-0074(4124)-3; SAMSO-TR-74-118) Avail: NTIS CSCL 09/1

A grounded, parallel-plate vacuum diode illuminated by X rays generates a two-sided distribution of non-Maxwellian photoelectrons. The resulting potential hill problem may be reduced to a first-order nonlinear differential equation subject to two-point boundary conditions. An iterative APL/360 program has been written to allow the user to perform on-line calculations of potentials. Numerical results are presented for several cases of incident blackbody radiation and unequal two-sided emission.
Author (GRA)

N74-29596# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ANTENNA DESIGN CONSIDERATIONS FOR A HARBOR SURVEILLANCE RADAR Final Report, Feb. - Nov. 1972
A. J. Cote, Jr. Nov. 1973 34 p refs
(Contract DOT-CG-03301-B)
(AD-779587; APL-MSC-73-350; USCG-D-58-74) Avail: NTIS CSCL 17/7

The report describes the examination of antenna design parameters performed during early development activity on the San Francisco Experimental Vessel Traffic System. This report outlines the basis for the initial choice of the antenna specifications; the final specifications varied slightly from those listed herein. Author (GRA)

N74-29791* Kanner (Leo) Associates, Redwood City, Calif.
DISCRETE REGULATION OF TRANSFER FUNCTION OF A CIRCUIT IN EXPERIMENTAL DATA AUTOMATIC COLLECTION AND PROCESSING SYSTEMS

G. S. Lyubashevskiy, A. A. Petrov, I. A. Sanayev, and V. E. Frishberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 17-20 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 18-20 (For availability see N74-29785 19-15)
CSCL 09E

N74-29801* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBROSHOCK STABILITY OF A MECHANICAL CONTACT BY MEASUREMENT OF ITS RESISTANCE
S. G. Butsevichyus and V.-S. S. Zaretskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 44-47 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 42-45 (For availability see N74-29785 19-15)
CSCL 09A

N74-29848* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF A SYSTEM WITH ACTIVE VIBRATION ISOLATION, CONSIDERING THE VIBROACOUSTICAL CHARACTERISTICS OF THE SOURCE AND OF THE ISOLATED OBJECT
M. D. Genkin, V. G. Yelezov, and V. V. Yablonskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 212-215 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 187-189 (For availability see N74-29785 19-15)
CSCL 09E

N74-29866* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATION CHARACTERISTICS OF ELECTRIC MOTORS
A. K. Bakshis and Yu. K. Tamoshyunas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 285-288 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 255-259 (For availability see N74-29785 19-15)
CSCL 09E

N74-29868* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF A CORRECTING FILTER WITH PHASE STABILIZATION OF THE ANGULAR VELOCITY OF A SYNCHRONOUS MOTOR BY THE FEEDBACK SYSTEM METHOD
K. A. Kazlauskas and A. I. Kurlavichus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 292-293 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 263 (For availability see N74-29785 19-15)
CSCL 09E

N74-29874* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF A VIBRATION-DAMPING UNIT FOR REDUCTION IN LOW-FREQUENCY VIBRATIONS OF ELECTRIC MOTORS
N. V. Grigoryev and M. A. Fedorovich *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 314-316 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 280-283 (For availability see N74-29785 19-15)
CSCL 09E

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-29597*# Radio Corp. of America, Somerville, N.J. Solid State Div.
PROCESS DEVELOPMENT OF BEAM-LEAD SILICON-GATE COS/MOS INTEGRATED CIRCUITS Final Report, 9 Nov. 1970 - 31 Dec. 1973
B. Baptiste and W. Boesenberg Jan. 1974 185 p refs
(Contract NAS8-26594)
(NASA-CR-120332) Avail: NTIS HC $12.25 CSCL 09C

Two processes for the fabrication of beam-leaded COS/MOS integrated circuits are described. The first process utilizes a composite gate dielectric of 800 A of silicon dioxide and 450 A of pyrolytically deposited A12O3 as an impurity barrier. The second process utilizes polysilicon gate metallization over which a sealing layer of 1000 A of pyrolytic Si3N4 is deposited. Three beam-lead integrated circuits have been implemented with the first process: (1) CD4000BL - three-input NOR gate; (2) CD4007BL - triple inverter; and (3) CD4013BL - dual D flip flop. An arithmetic and logic unit (ALU) integrated circuit was designed and implemented with the second process. The ALU chip allows addition with four bit accuracy. Processing details, device design and device characterization, circuit performance and life data are presented. Author

N74-29598# Bochum Univ. (West Germany).
NUCLEAR RESONANCE ELECTRONICS FOR HIGH FREQUENCY MEASUREMENTS. TECHNICAL IMPULSE AND VARIABLE FREQUENCY MEASUREMENTS ON NARROW AND WIDE RESONANCE LINES Ph.D. Thesis [KERNRESONANZ-ELEKTRONIK FUER HOHE MESSFREQUENZEN IMPULSTECHNISCHE UND FREQUENZVARIABLE MESSUNG SCHMALER UND BREITER RESONANZLINIEN]
Harald Berger 1972 126 p refs In GERMAN
Avail: NTIS HC $9.50

A high resolution, variable frequency impulse spectrometer is reported for nuclear resonance measurements on magnetically ordered materials in the frequency region from 60 to 200180 MHz. The instrument can be worked with impulse-and phase-coherence and has the possibility of a phase sensitive signal direction. Transl. by G.G.

N74-29599# Technische Universitaet, Brunswick (West Germany).
THEORETICAL AND PRACTICAL STUDIES ON A FREQUENCY ANALOG SPEED CONTROL WITH ALTERNATING CURRENT INVERTER CONTROLLED ASYNCHRONOUS MACHINE Ph.D. Thesis [THEORETISCHE UND PRAKTISCHE UNTERSUCHUNG EINER FREQUENZANALOGEN DREHZAHLREGELUNG MIT WECHSELRICHTERGESPEISTER ASYNCHRONMASCHINE]
Horst Kalis 1972 191 p refs In GERMAN
Avail: NTIS HC $12.75

Frequency analog speed control is required for correct and noise free transmission of analog signals. Phase locked control loop filters provide for correct frequency transformations in the input/output system of alternating current driven asynchronous machines. Transl. by G.G.

N74-29600# Technische Universitaet, Brunswick (West Germany).
THE SELECTION OF DISCRETE CONTROLS IN THE PRESENCE OF STOCHASTIC DISTURBANCES Ph.D. Thesis [ZUR WAHL DISKRETER REGLERBEI ANWESENHEIT STOCHASTISCHER STOERUNGEN]
Hansjoerg Hammer 1973 151 p refs In GERMAN
Avail: NTIS HC $10.75

The synthesis of a digital controller for randomly disturbed systems is considered. Emphasized are problems that develop during control of time dependent, aperiodical damped low pass transmission with low frequency scanning. Stochastic disturbances in the output spectrum of the low pass noise are regulated by minimal median quadratic continuous control variations where an optimal control position is obtained when the rational part of the transmission function in the controller is compensated. Transl. by G.G.

N74-29601# Toulouse Univ. (France).
CONTRIBUTION OF THE THEORY OF CONTROL SYSTEMS CONTAINING RECTIFYING THYRISTORS Ph.D. Thesis

[CONTRIBUTION A LA THEORIE DES SYSTEMES DE COMMANDE COMPRENANT UN REDRESSEUR A THYRISTORS]
Pierre Thierry 2 Jul. 1973 159 p refs In FRENCH
Avail: NTIS HC $11.00

Results obtained in the study of local closed loop control systems with polyphase rectifiers are presented. Power amplification and weak and strong signal levels are discussed. Methods, including the discrete and Z transform, used to study the control systems are discussed. Transl. by E.H.W.

N74-29602# Technische Hochschule, Hanover (West Germany).
A CONTRIBUTION TO THE STABILITY AND TRANSFER BEHAVIOR ON NONLINEAR CONTROL SYSTEMS WITH TWO VARIABLES Ph.D. Thesis [EIN BEITRAG ZUM STABILITAETS- UND UEBERTRAGUNGSVERHALTEN NICHTLINEARER ZWEIGROESSENREGELKREISE]
Gero Wohlschlegal 1972 136 p refs In GERMAN
Avail: NTIS HC $10.00

Absolute stability of a two variable control loop is calculated by using the stability criteria of Liapunov and Popov. It is shown that the selection of positive definitive matrices Q and O in the Liapunov function determines the dimensions of the stability region. Calculations on a two variable control loop with dead zones are used to analyze the effects of various disturbances on the stability behavior of a nonlinear systems. Transl. by G.G.

N74-29603# Paris Univ. (France).
CONTRIBUTION OF THE STUDY OF RAPID SWITCHING ON INTENSE CURRENTS Ph.D. Thesis [CONTRIBUTION A L'ETUDE DE L'INTERRUPTION RAPIDE DE COURANTS INTENSES]
Alain Delmas 5 Jun. 1973 93 p refs In FRENCH
Avail: NTIS HC $7.75

An examination was made of the rapid switching of circuits with intense currents. Particular attention was given to the properties of the switching principle at 10,000 amperes. Data are also given on: (1) the function of primary switching and the mechanism of circuit breaking, particularly that switching caused by the explosion of H2 and O2 mixing, (2) experimental study of elementary switching, and (3) minimum energy required to assure a good switching circuit. Transl. by E.H.W.

N74-29604*# National Aeronautics and Space Administration, Washington, D.C.
AUTOMATIC CONTROLS AND REGULATORS: A COMPILATION Technology Utilization
[1974] 36 p
(NASA-SP-5956(01)) Avail: NTIS HC $1.00 CSCL 09C

Devices, methods, and techniques for control and regulation of the mechanical/physical functions involved in implementing the space program are discussed. Section one deals with automatic controls considered to be, essentially, start-stop operations or those holding the activity in a desired constraint. Devices that may be used to regulate activities within desired ranges or subject them to predetermined changes are dealt with in section two. Author

N74-29605# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROBLEMS IN THE PRACTICAL REALIZATION OF MULTISTABLE ELEMENTS
V. S. Verkhovtsev 3 Apr. 1974 11 p refs Transl. into ENGLISH from the book "Mnogoustoichivye Elementy i ikh Primenie. Sbornik Statei" 1971 p 186-190
(AD-778502; FTD-HT-23-1015-74) Avail: NTIS CSCL 09/5

The article examines two arrangements of multistable elements with width and phase dynamic signs which are related to the group of multistable elements with frequency conversion. The block diagrams are the same for both types of multistable elements being examined and they include a modulator (width or phase), a selective amplifier, and a phase-sensitive detector with low-frequency filter. GRA

N74-29606# Alabama Univ., University. Dept. of Electrical Engineering.
CURRENT MODE SECOND BREAKDOWN
W. D. Raburn 7 Nov. 1973 19 p refs
(Contract DAHC04-72-C-0001; DA Proj. 1X2-22254-D-678) (AD-779459; RG-73-31) Avail: NTIS CSCL 09/1

A discussion on current mode second breakdown is given. A computer model is given which shows the voltage-current density characteristic with different injection ratios for the n(+) np(+) diode with reach-through. The model shows that there will always be a negative differential resistance for any injection ratio at high current densities. It is argued, however, that the experimentally observed second breakdown must be explained by a sudden change in injection ratio and not by the change in voltage with any given injection ratio. A discussion of the importance of the base resistance in causing a change in injection ratio is given. Finally an approximate physical model and experimental verification are given. Author (GRA)

N74-29607# Northrop Corp., Hawthorne, Calif.
SIMPLIFIED MICROCIRCUIT MODELING Final Report, 31 May 1972 - 14 Nov. 1973
D. N. Pocock, M. G. Krebs, and C. W. Perkins Mar. 1974 278 p refs
(Contract F29601-72-C-0092; DNA Proj. NWED-TB-027) (AD-777896; NRTC-73-43R; AFWL-TR-73-272) Avail: NTIS CSCL 09/5

Results are presented on the application of previously developed techniques to generate radiation-inclusive simplified models of several types of digital and linear microcircuits of Medium-Scale Integrated/Large-Scale Integrated (MSI/LSI) complexity. Methods for including the effects of neutron degradation and electrical pulse overstress in simplified terminal models are developed. Models were generated for a Transistor-Transistor Logic (TTL) decade counter, Complementary/Metal Oxide Semiconductor (C/MOS) full adder, voltage comparator, video/buffer amplifier, low-level/voltage clamp amplifier, and a bootstrap amplifier. The models represent the electrical and radiation responses of the devices within engineering accuracy and are applicable to the computer-aided design and analysis of large electronic systems. It has been concluded that simplified microcircuit modeling is a viable and important technology that allows systems analysis on existing computer codes. Further development of generalized techniques is recommended. Author (GRA)

N74-29608# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
[ELECTRONIC RESEARCH, INCLUDING WAVE PROPAGATION, CONTROL THEORY, AND ANTENNA STUDIES] Semiannual Progress Report, 1 Jul. - 31 Dec. 1973
Apr. 1974 98 p refs
(Contracts N00014-67-A-0298-0006; N00014-67-0298-0005) (AD-778867; SAPR-87) Avail: NTIS CSCL 20/12

Contents: Very Low Frequency Wave Propagation; Electron and Solid State Physics; Control Theory and Applications; Electronic Circuits and Instrumentation; Electromagnetic Phenomena. GRA

N74-29792* Kanner (Leo) Associates, Redwood City, Calif.
ESTIMATION OF ERRORS IN MEASUREMENT OF STATIONARY SIGNALS FROM A CONTINUOUS FREQUENCY BAND SPECTRUM
V. A. Ivanov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 21-24 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 21-23 (For availability see N74-29785 19-15)
CSCL 09C

N74-29859* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRONIC DAMPING OF MECHANICAL VIBRATIONS
P. Vasilyev and A. Navitskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 260-263 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 231-235 (For availability see N74-29785 19-15)
CSCL 09C

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-29609# Environmental Protection Agency, Research Triangle Park, N.C.
[DESIGN AND OPERATION OF NATIONAL ENVIRONMENTAL RESEARCH CENTER] Annual Report, 1972
Jun. 1973 85 p
Avail: NTIS HC $7.25

The mission, history, organization, and activities of the center are discussed. The Community Health and Environmental Surveillance System and the Regional Pollution Study are emphasized. Individual laboratories of the center are described in detail. E.J.O.

N74-29610*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
SIMULATORS' VALIDATION STUDY: PROBLEM SOLUTION LOGIC Short-Haul Air Transportation Program
Michael B. Schoultz Mar. 1974 19 p
(Grant NGR-47-005-181)
(NASA-CR-138305; Memo-403213) Avail: NTIS HC $4.00 CSCL 14B

A study was conducted to validate the ground based simulators used for aircraft environment in ride-quality research. The logic to the approach for solving this problem is developed. The overall problem solution flow chart is presented. The factors which could influence the human response to the environment on board the aircraft are analyzed. The mathematical models used in the study are explained. The steps which were followed in conducting the validation tests are outlined. Author

N74-29611*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
[MISSISSIPPI TEST FACILITY RESEARCH PROJECTS] Final Report, Sep. 1971 - Aug. 1974
C. A. Whitehurst Aug. 1974 19 p refs
(Grant NGL-19-001-097)
(NASA-CR-139370) Avail: NTIS HC $4.00 CSCL 14B

Research capilities of Louisiana State University are reported for sustaining a program which complements the Mississippi Test Facility. Projects reported during this period are discussed and include the development of a spectral analyzer, and investigations of plant physiology. Papers published during this period are also listed. M.C.F.

N74-29612*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFRACTION STUDIES APPLICABLE TO 60-FOOT MICROWAVE RESEARCH FACILITIES
Richard F. Schmidt Jul. 1973 53 p refs
(NASA-TM-X-70707; X-811-73-39) Avail: NTIS HC $5.75 CSCL 14B

The principal features of this document are the analysis of a large dual-reflector antenna system by vector Kirchhoff theory, the evaluation of subreflector aperture-blocking, determination of the diffraction and blockage effects of a subreflector mounting structure, and an estimate of strut-blockage effects. Most of the computations are for a frequency of 15.3 GHz, and were carried out using the IBM 360/91 and 360/95 systems at Goddard Space Flight Center. The FORTRAN 4 computer program used to perform the computations is of a general and modular type so that various system parameters such as frequency, eccentricity, diameter, focal-length, etc. can be varied at will. The parameters of the 60-foot NRL Ku-band installation at Waldorf, Maryland, were entered into the program for purposes of this report. Similar calculations could be performed for the NELC installation at La Posta, California, the NASA Wallops Station facility in Virginia, and other antenna systems, by a simple change in IBM control cards. A comparison is made between secondary radiation patterns of the NRL antenna measured by DOD Satellite and those obtained by analytical/numerical methods at a frequency of 7.3 GHz. Author

N74-29613# Brookhaven National Lab., Upton, N.Y.
ROTATING FLUIDIZED BED REACTOR FOR SPACE NUCLEAR PROPULSION Annual Report, Jul. 1972 - Jan. 1973
Sep. 1973 33 p refs Sponsored by AEC
(BNL-50405) Avail: NTIS HC $4.00

A program for computing the thrust/weight ratio of a rocket engine, based on a rotating fluidized bed reactor, is described. The radial and axial power shapes are illustrated and discussed. The variation of propellant temperatures and pressure within the bed of a U-233 fueled rocket engine having a 90,000-N (20,000-foot lbs) thrust is computed. An experimental method of measuring the heat transfer coefficient is outlined, and finally the modifications of the present experimental setup to make it more compatible with a rocket reactor are described. Author (NSA)

N74-29614# Naval Postgraduate School, Monterey, Calif.
THE MONTEREY PENINSULA AIRPORT IN THE 1970'S AND 1980'S: A DEMAND FORECAST M.S. Thesis
Amos Lee Maples Mar. 1974 121 p refs
(AD-776280) Avail: NTIS CSCL 01/5

The Monterey Peninsula Airport is modeled as a three component (airside, terminal, and streetside) system, and forecasts of demand and utilization for each component are developed through use of linear and log linear regression techniques. Specifically, forecasts for General Aviation Operations, Airline Passenger Enplanements and Passenger Associated Visitors, the number of automobiles utilizing the roadway during the peak hour (two scheduled airline departures and two scheduled airline arrivals within the same hour), and associated parking space requirements have been made for the years 1973, 1974, 1975, 1980, and 1985. Author (GRA)

N74-29615# Naval Air Test Facility, Lakehurst, N.J.
INSPECTION HISTORY OF CHICAGO BRIDGE AND IRON COMPANY STEAM RECEIVERS USED ON TC13 MOD 0 AND MOD 1 STEAM CATAPULTS Interim Report, Oct. 1965 - Nov. 1973
Edward J. Yesunas 8 Apr. 1974 17 p refs
(AD-777673; NATF-EN-1129) Avail: NTIS CSCL 01/5

The report describes the various inspections performed on three steam receivers. The various methods used to inspect the receivers were visual, magnetic particle, ultrasonic, radiographic, and dye penetrant. The steam receivers were used at the TC13 and TC13 Mod 1 catapult sites from October 1965 to November 1973. This is the first time in five inspections that any cracks were found. All previous inspections found the receivers free of defects. The cracks found during this inspection in no way affect the structural strength of the receivers. All cracks were ground out and faired/blended into surrounding metal. No repair welding was needed. Inspection of all three receivers will be conducted every 18 months to insure structural integrity of the receivers. Author (GRA)

N74-29616# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
UH-1 GROUND HANDLING WHEEL ADAPTER BARS FOR OH-58 HELICOPTERS. PROTOTYPE DESIGN, FABRICATION, AND USER TEST Final Report
Joseph T. Gurganious Mar. 1974 42 p refs
(AD-778199; LWL-TR-74-27) Avail: NTIS CSCL 01/5

In response to the Army's need to move OH-58 helicopters over difficult terrain areas, USALWL devised and developed the UH-1 Ground Handling Wheel Adapter Bar System for OH-58 Helicopters. The system was feasibility tested by USAATB, Fort Rucker. It was user evaluated by MASSTER and 1st Cav. Div. at Fort Hood, and by 101st Airborne Div. at Fort Campbell. Conclusions indicate that the UH-1 Ground Handling Wheel Adapter Bar System can provide the Army with a safe, practical, and suitable means for ground handling the OH-58 helicopters over unprepared terrain. Author (GRA)

N74-29617# Army Foreign Science and Technology Center, Charlottesville, Va.

THE MOTOR VEHICLE WHICH AS YET DOESN'T EXIST
V. Demidov 24 Jan. 1974 11 p Transl. into ENGLISH from Znanie-Sila (USSR), no. 3, 1972 p 16-18
(AD-777644; FSTC-HT-23-171-73) Avail: NTIS CSCL 13/6

Concepts for propulsion systems to be used with automobiles which will reduce the air pollution produced by exhaust gases and also conserve finite sources of energy are presented. The use of a system consisting of electric motors, and electric battery, and a Stirling cycle engine to charge the battery is emphasized. External combustion engines producing steam for power are discussed. The advantages and disadvantages of the systems are analyzed. Author

N74-29618# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
AN EVALUATION OF PASSIVE DEICING, MECHANICAL DEICING AND ICE DETECTION Final Report, Aug. 1971 - Nov. 1973
S. F. Ackley, K. Itagaki, and M. Frank Nov. 1973 56 p refs
(Contract DOT-FA71WAI-236)
(AD-777947; CRREL-IR-351; FAA-RD-74-50) Avail: NTIS CSCL 09/5

It was found that passive deicing methods do not operate with sufficient reliability to be used in operational situations and that in general, successful use of passive deicers is usually linked to a particular geometry, icing condition or waste energy availability that do not commonly exist at the radome sites of interest. Mechanical deicing was evaluated and test mechanical deicers were constructed and subjected to testing in cold rooms and field-tests at Mt. Washington, N.H. It was found that an inflatable deicing system coupled with a commercially available ice detector could be configured as an automatic deicing system. This system showed success under light and heavy icing conditions and during long periods of icing activity. (Modified author abstract) GRA

N74-29619# Mitre Corp., McLean, Va.
THE TRACKED RAM AIR CUSHION VEHICLE (TRACV). A SYSTEM DEFINITION STUDY Technical Report, Nov. 1972 - Nov. 1973
W. E. Fraize and T. M. Barrows (Transportation Systems Center) Nov. 1973 218 p refs
(Contract DOT-FR-30015)
(PB-230485/5; MTR-6554-Rev-1; FRA-ORD/D-74-27-Rev-1) Avail: NTIS HC $5.75 CSCL 13F

Aerodynamic levitation for high speed ground transportation vehicles (the so-called ram wing) has led to the concept of a Tracked Ram Air Cushion Vehicle (TRACV). The TRACV concept is viewed as an air-supported alternative to the Tracked Levitated Vehicle (TLV) system candidate that offers potential advantages of technical simplicity. The basic principles of dynamic air cushion levitation and guidance and the features of system components are described. Fluid and electromagnetically propelled vehicles are evaluated in terms of a system with 100 passenger vehicles with a 300 mph cruise capability, with emphasis given to the technically more attractive fluid propulsion system. GRA

N74-29620# Sundstrand Aviation-Rockford, Ill.
TRANSMISSION STUDY FOR TURBINE AND RANKINE CYCLE ENGINES
M. A. Cordner and D. H. Grimm 15 Dec. 1972 186 p refs
(Contract EPA-68-04-0034)
(PB-229879/2; SA/AER-657; APTD-1558) Avail: NTIS CSCL 13F

A study was initiated to quantitatively assess the technical and economic feasibility of existing and potential types of transmissions most suitable for the gas turbine and rankine cycle engines. The study was accomplished through a two-phase, multi-task program which included: (1) evaluation of transmission types through a feasibility study and ultimate selection of a transmission type, and (2) evaluation of the selected transmission type through design calculations and layouts, performance analysis, control system analysis, and cost analysis. A number of different types of transmission were initially evaluated including conventional multi-shift, hydrostatic, hydrokinetic, electric, belt/chain, hydromechanical, and traction types. GRA

N74-29621# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
INSTALLATION OF HEAVY DUTY TRUSS WEB EXTRUDED ALUMINUM AIRFIELD LANDING MAT Final Report
Dewey W. White, Jr. May 1974 41 p refs
(AD-779423; AEWES-Instruction-S-74-2) Avail: NTIS CSCL 01/5

The report presents a description of the heavy-duty truss-web extruded aluminum airfield landing mat and the ancillary items that are used with it and outlines procedures for the installation and replacement of the mat and ancillary items. These procedures are presented as a guide for the user in the theater of operations. Author (GRA)

N74-29622# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT ALBUQUERQUE INTERNATIONAL AIRPORT Final Report
George D. Ballentine and Phil V. Compton May 1974 40 p (AF Proj. 683M)
(AD-779756; AFWL-TR-74-37) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory standard skid-resistance test conducted at the Albuquerque International Airport on 15 through 20 November 1973 are analyzed. The data show the runway surface had definite hydroplaning potential. This condition is attributed to the highly polished aggregate in the asphaltic concrete surface and an extremely heavy rubber deposit along the entire runway length. Author (GRA)

N74-29623# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
DESIGN AND TEST OF AN AIR CUSHION FIELD DOLLY FOR UH/AH HELICOPTERS Final Report
Charles R. Wilson Mar. 1974 23 p
(AD-779386; LWL-TR-74-23) Avail: NTIS CSCL 13/6

The air cushion field dolly is an air-supported dolly without forward propulsion. Tests indicated that the dolly operated as intended up to helicopter gross weights of 7500 pounds. At helicopter gross weights above 7500 pounds the dolly operated satisfactorily on smooth ground, but required excessive drawbar pull on rough terrain. Although the dolly was capable of performing the desired mission, it was considered that it was too large and too complicated, relatively, for troop use in a forward area. (Modified author abstract) GRA

N74-29624# TRW Systems Group, Redondo Beach, Calif.
MAGNETIC FIELD ANNIHILATION OF IMPULSIVE CURRENT SHEETS Interim Scientific Progress Report
C. Lee Dailey 31 Mar. 1974 33 p refs
(Contract F44620-71-C-0031; AF Proj. 9752)
(AD-779736; AFOSR-74-0747TR) Avail: NTIS CSCL 21/3

The report describes additional results obtained during the past year on the magnetic field annihilation impulsive plasma accelerator. Flat spiral coils 40 CM in diameter separated by 3.6 cm are used to produce anti-parallel radial fields in an axially symmetric field configuration. These fields exist for a few microseconds as a 5 kilojoule capacitor bank is discharged through the coils producing planar plasma current sheets that are accelerated axially toward the midplane between the coils where they collide. Radial magnetic field embedded in the plasma diffuses through the plasma after collision and is annihilated at the midplane. The data and analysis presented here complete the investigation of the two-coil accelerator. GRA

N74-29625# Naval Research Lab., Washington, D.C.
NRL VAN DE GRAAFF OPERATION, 1 JAN. - 31 DEC. 1973
K. L. Dunning Apr. 1974 67 p refs
(AD-779264; NRL-MR-2787) Avail: NTIS CSCL 20/7

The report is the ninth in a series of summaries on the use and development of the NRL 5-MV Van de Graaff accelerator and associated instruments. In this reporting period (1 January to 31 December 1973), for the first time anywhere, a measurement to determine dose-rate effects in the simulation of neutron damage to reactor materials with 2.8-MeV nickel ions has been made. The nickel-ion flux was changed by a factor of 100, all other parameters being constant; the relationship between

specimen swelling and temperature was determined for two fluxes. New species of ion beams are now available from the 100-keV ion-implantation accelerator; this apparatus has been used for many optical and electron device-related implantations. The very successful operation of the modified Hill-Nelson sputtering ion source in the Van de Graaff has opened the way to a wide variety of metallic ions with MeV energies. A new digital-optical telemetering system has added significantly to the efficiency of Van de Graaff operation. (Modified author abstract) GRA

N74-29626# Naval Training Equipment Center, Orlando, Fla.
LASER AIR-TO-AIR GUNNERY TRAINER. 1: INTRODUCTION OF A SEMICONDUCTOR LASER SYSTEM PROVIDING GUNNERY TRAINING WITHOUT NEED FOR AN OPERATIONAL WEAPON AND AMMUNITION Interim Report, Mar. 1973 - Feb. 1974
Albert H. Marshall, Herbert Towel, and George S. Siragusa Apr. 1974 36 p refs
(AF Proj. 3715)
(AD-779256; NAVTRAEQUIPC-IH-230) Avail: NTIS CSCL 05/9

The report describes a semiconductor laser system as part of a cooperative scoring system which can be easily installed on a trainer aircraft and, when used with towed retroreflective targets, will provide gunnery training without the need for an operational weapon and ammunition. GRA

N74-29627# Army Land Warfare Lab., Aberdeen Proving Ground, Md.
DESIGN OF A POWERED WHEEL KIT FOR UH/AH HELICOPTERS Final Report
Charles R. Wilson Apr. 1974 20 p
(AD-779387; LWL-TR-74-39) Avail: NTIS CSCL 13/6

The powered wheel kit consists of the standard unpowered ground handling wheel set, which has been modified by application of a power package. Each wheel is driven by a two-cycle engine and hydraulic drive unit. The kit was designed and fabricated, but only brief functional check-out tests were conducted. The task has been reassigned to the Aviation Systems Command for further testing. (Modified author abstract) GRA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-29628 Michigan Univ., Ann Arbor.
APPLICATION OF THEORY OF A NEWTONIAN FLUID AND AN ISOTROPIC NONLINEAR ELASTIC SOLID TO DIFFUSION PROBLEMS Ph.D. Thesis
John Jin-Jau Shi 1973 109 p
Avail: Univ. Microfilms Order No. 74-15854

A theory of interacting continua is used to study two examples of non-linear diffusion of a Newtonain fluid through a non-linear isotropic elastic solid: (1) the pressure-induced steady-state diffusion through a uniformly stretched plate and (2) axisymmetric steady-state diffusion through a spherical shell. Constitutive equations for partial stresses and diffusive body force are developed assuming incompressibility for solid, fluid and mixture. The static part depends on a free energy function for the mixture, which here is taken to be one derived from statistical kinetic theory considerations. The dynamical part depends on the relative velocities and vorticities and rate of deformation of the fluid. This introduces certain additional material parameters. The theory provides sufficient equations to determine the state of a solid swollen with fluid only if partial pressures can be precribed. Since only total pressure can be reasonably prescribed, the system of useful equations is reduced by one. Dissert. Abstr.

N74-29629 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A NUMERICAL SOLUTION OF INCOMPRESSIBLE TURBULENT CHANNEL FLOWS BY INVARIANT MODELING Ph.D. Thesis
Robert Poplawski 1973 194 p
Avail: Univ. Microfilms Order No. 74-15056

A numerical technique was developed for incompressible turbulent channel flows which predicts the entire flow field downstream of any initial station. The technique includes any of the flow fields from a two-dimensional confined ejector region to the fully developed turbulent flow regime. The continuity, momentum, four one-point velocity correlations and a volumetric constraint equation are used as the fundamental governing equations. Closure is achieved by using Donaldson's Invariant Models which requires the specification of six constants to accommodate the experimental data. The numerical solutions were obtained by converting the momentum and one point velocity correlation equations (with the boundary conditions) to an implicit linear tri-diagonal set of 5N-7 equations in 5N-7 unknowns (N represents the number of transverse grid lines). They were solved by inverting N five by five matrices. Dissert. Abstr.

N74-29630 Washington State Univ., Pullman.
OPTIMIZATION OF JET ENTRAINMENT WITH A DIFFUSER Ph.D. Thesis
Shen Tseh Chen 1974 124 p
Avail: Univ. Microfilms Order No. 74-16357

Investigations were conducted to study the effects on entrainment as an axisymmetrical submerged turbulent jet passes through a coaxial cylindrical diffuser, as well as the effects of diffuser configurations. The objective was to determine the governing geometric parameters and the optimum entrainment efficiency which is defined as the ratio of the discharge entrained by the jet from the surrounding fluid to the initial jet discharge. Theoretical considerations of the mean flow pattern of the partially confined jet were based on the similarity type of analysis using the fundamental continuity equation, the equations of motion and of momentum equilibrium. Experimental tests were conducted for a range of diffuser parameters such as the diameter, length, and location. Mean and turbulent velocity components in low speed air jets were measured by means of hot-wire anemometry and pitot tubes. The results obtained confirmed the theoretical analysis and provided values for the related coefficients. Dissert. Abstr.

N74-29631 University of Southern Calif., Los Angeles.
MEASUREMENTS OF MOLECULAR VELOCITY DISTRIBUTION FUNCTIONS IN AN ARGON NORMAL SHOCK WAVE AT MACH NUMBER 7 Ph.D. Thesis
Tobenette Holtz 1974 145 p
Avail: Univ. Microfilms Order No. 74-14445

Two simple moments of the molecular velocity distribution functions were measured throughout an argon normal shock wave in a Mach number 7-18 wind tunnel flow. The velocities were derived using a Fabry-Perot etalon to resolve the Doppler shifts in electronic beam stimulated fluorescence of the gas atoms. Population distribution measurements were made both parallel and perpendicular to the direction of flow. The experimental non-equilibrium distribution functions are compared with various analytical profiles generated from bimodal formulations, from Monte Carlo solutions of the Boltzmann equation, and from Monte Carlo simulation of the shock process. To facilitate these comparisons, the calculated profiles have been convolved with measured apparatus window functions. Dissert. Abstr.

N74-29632 Washington Univ., Seattle.
THE EFFECTS OF SURFACE ADSORPTION, HEAT TRANSFER, AND MASS TRANSFER ON THE STABILITY OF CAPILLARY JETS Ph.D. Thesis
Harry Calvin Burkholder 1973 200 p
Avail: Univ. Microfilms Order No. 74-15560

The interfacial hydrodynamics of laminar liquid jets undergoing mass or heat exchange with surroundings are investigated theoretically using linear stability analysis. Solutions are obtained for liquid jets in relative motion through gases and for liquid jets in liquids with negligible relative motion. The mass transfer models are limited to dilute systems. They include the effects of solute adsorption and consider the presence of insoluble surfactant monolayers as a limiting case. The theoretical stability results for the liquid gas case are confirmed qualitatively by experiments in this study employing water jets in air with acetone

as the transferring solute. Solute transfer in both directions is used with transfer out leading to stabilization and transfer in leading to destabilization. Dissert. Abstr.

N74-29633 Virginia Polytechnic Inst. and State Univ., Blacksburg.
STUDIES OF A HEATED, TURBULENT JET IN A SHALLOW, BOUNDED WATERWAY Ph.D. Thesis
Benjamin Lee Sill 1973 247 p
Avail: Univ. Microfilms Order No. 74-14505

The present study experimentally and analytically examines the effects encountered when a heated jet is discharged into a shallow, bounded mainstream. Experimental measurements included photographic, flow visualization, velocity and temperature for both heated and unheated jets. The effects of velocity variation, boundedness, and buoyancy on the flow field were of particular interest. Jet to free stream velocity ratios of 4.9 to 17.2 and Froude numbers of 2.2 to 5.8, and infinity were studied. Boundedness, buoyancy, and turbulent mixing were included in a mathematical analysis of this process by using an integral method. In the form presented, the theory predicts all primary effects as to trends and magnitudes. Contrary to many current studies, jet growth and not entrainment, was modeled as a closure relation. Dissert. Abstr.

N74-29634 Texas Univ., Austin.
SECOND ORDER EFFECTS IN UNSTABLE BOUNDARY LAYERS ON A FLAT PLATE Ph.D. Thesis
Basil Naman Antar 1974 204 p
Avail: Univ. Microfilms Order No. 74-14668

A numerical study of one stage of the transition region from laminar to turbulent flow of the boundary layer over a flat plate was performed. The theoretical development follows that of Benney and Lin in which the interaction of a two-dimensional and a restricted three-dimensional periodic disturbance were considered up to second order terms in a series expansion. Several laminar profiles were studied, all belonging to the Falkner-Skan equation. The assumption of equal wave speeds for two-dimensional and the three-dimensional disturbances was relaxed giving rise to a slow modulation of the mean secondary flow. The resulting mean secondary flow compared favorably with both the existing experimental work and the restricted analytical solution of Benney. The flow depended principally on the disturbance spanwise wave number, whose varation resulted, in some instances, in a system of counterrotating vortices, one on top of the other, for the mean secondary flow. Dissert. Abstr.

N74-29635 Georgia Inst. of Tech., Atlanta.
AN EXPERIMENTAL INVESTIGATION OF LAMINAR AND TURBULENT MIXING OF COMPRESSIBLE JETS AT LOW REYNOLDS NUMBERS Ph.D. Thesis
Dale Edward Jensen 1974 397 p
Avail: Univ. Microfilms Order No. 74-16134

The subject of this research is the experimental investigation of bounded rectangular jets in the low Reynolds number compressible flow regime. Both a single and two perpendicular interacting jets are considered. Limited information is also presented on the interaction of these jets with a diffuser. The flow fields in this study were created by providing a rarefied flow of air through the experimental model with a vacuum pump. Experimental studies were performed to determine the out-put flow and pressure resulting from the interaction of a jet flow upon a simple receiver and diffuser. Attempts to predict pressure flow characteristics with existing theories using the free jet data correlation have produced mixed results. This is attributed to the lack of a good analytical model of the interaction of a skewed nonuniform velocity profile with a receiver, and the growth of boundary layers on the top and bottom plates of the experimental model negating the two-dimensional assumptions made in these calculations. Dissert. Abstr.

N74-29636# Technische Hogeschool, Eindhoven (Netherlands).
THE CALCULATION OF PHYSICAL AND THERMODYNAMIC CHARACTERISTICS OF PRESSURE FLUIDS, AND THE DETERMINATION OF THE OVERALL EFFECTIVENESS IN PUMPS CONSIDERING THE PRESSURE FLUID THERMODYNAMICS Ph.D. Thesis [DIE BERECHNUNG PHYSIKALISCHER UND THERMODYNAMISCHER KENNWERTE VON DRUCKFLUESSIGKEITEN SOWIE DIE BESTIMMUNG DES GESAMTWIRKUNGSGRADES AN PUMPEN UNTER BERUECKSICHTIGUNG DER THERMODYNAMIK FUER DIE DRUCKFLUESSIGKEIT]
Klaus Witt 8 Feb. 1974 187 p refs In GERMAN
Avail: NTIS HC $12.50

Physical and thermodynamic characteristics of hydraulic fluids are used to form mathematical models for calculating dynamic viscosity and density properties of oil mixtures according to their molecular structures. Hydraulic fluids are separated in paraffinic oils and naphthenic oils, and example calculations for their different performances at t = 50 C are given for a paraffinic oil, a naphthenic oil, a petroleum oil, and a synthetic hydraulic fluid up to a pressure of 2501 bar. Transl. by G.G.

N74-29637# Technische Hogeschool, Eindhoven (Netherlands).
HIGH CURRENT DISCHARGES IN A FORCED GAS FLOW Ph.D. Thesis
Franciscus Jozef Andriessen 9 Oct. 1973 125 p refs
Avail: NTIS HC $9.25

The behavior of an electric discharge in a forced gas flow during the pre-current-zero process is examined. The investigation is limited to the period when the electric discharge shows a more or less stable behavior. The experiments were carried out with stabilized discharges with very small gas flow. The electric discharges showed thermal equilibrium at pressures on the order of one atmosphere and higher. It was determined that the energy supplied per unit length of the discharge is almost entirely dissipated radially to the surrounding wall by means of molecular heat conduction. If the molecular heat conductivity of the gas is known as a function of temperature, it is possible to calculate the temperature distribution as a function of the radius of the discharge. Author

N74-29638*# Fluid Mechanics and Thermal Systems, Inc., Waverly, Ala.
COMBUSTION OF HYDROGEN-AIR JETS IN LOCAL CHEMICAL EQUILIBRIUM: A GUIDE TO THE CHARNAL COMPUTER PROGRAM Final Report
D. B. Spalding, B. E. Launder, A. P. Morse, and G. Maples
Washington Jun. 1974 87 p refs
(Contract NAS1-12167)
(NASA-CR-2407; Rept-73-1) Avail: NTIS HC $4.00 CSCL 20D

A guide to a computer program, written in FORTRAN 4, for predicting the flow properties of turbulent mixing with combustion of a circular jet of hydrogen into a co-flowing stream of air is presented. The program, which is based upon the Imperial College group's PASSA series, solves differential equations for diffusion and dissipation of turbulent kinetic energy and also of the R.M.S. fluctuation of hydrogen concentration. The effective turbulent viscosity for use in the shear stress equation is computed. Chemical equilibrium is assumed throughout the flow. Author

N74-29639# Sydney Univ. (Australia). Dept. of Aeronautical Engineering.
FINITE ELEMENT ANALYSIS OF A HYDRODYNAMIC BEARING
G. P. Steven May 1974 39 p refs
(ATN-7402) Avail: NTIS HC $5.00

The problem of determining the pressure in an incompressible fluid flowing between two non-parallel surfaces using the finite element method is discussed. The governing differential equation is the generalized Reynolds equation which is suitable for a variational solution by a finite element technique. The computer program used to solve various problems using the finite element technique is presented. The results of three illustrative bearing arrangements are analyzed. Author

N74-29640# National Physical Lab., Teddington (England). Div. of Maritime Science.
ON THE STABILITY OF BOUNDARY LAYERS
M. Gaster May 1974 29 p refs
(NPL-Mar-Sci-TN-102) Avail: NTIS HC $4.50

The stability of small travelling wave disturbances in the flow over a flat plate is discussed. An iterative method is used to generate an asymptotic series solution in inverse powers of the Reynolds number Ux/upsilon to the one half power. The neutral stability boundaries given by the first two terms of this

series are obtained and compared with experimental data. It is shown that the parallel flow approximation leads to a valid solution at very large Reynolds numbers. Author

N74-29641# Swedish State Shipbuilding Experimental Tank, Goteborg.
ON THRESHOLD PRESSURES FOR THE ONSET OF BUBBLE GROWTH
Bror Persson 1974 39 p refs Presented at the ASME Winter Ann. Meeting, N. V., Nov. 1972
(Rept-71) Avail: NTIS HC $5.00

Conditions are investigated for the onset of the growth of a spherical gas bubble in a viscous, incompressible liquid. The bubble is assumed to be exposed to a step pressure pulse of infinite duration. For the case with constant gas content in the bubble it is found that upper and lower bounds for the threshold pressure exist and occur for infinite and vanishing viscosity respectively. The analysis indicates that the effects of inertia, viscosity and thermodynamic state of the gas have little influence on the threshold pressure, while the effect of the gas content is considerable. Thermal relaxation times for a bubble subjected to a step change in the temperature are calculated, indicating when the bubble can be considered as isothermal during its expansion. The influence of gas diffusion on the threshold pressure is estimated approximately. The problems considered are to some extent related to the onset of cavitation. Author

N74-29642# Weapons Research Establishment, Salisbury (Australia).
THE PREDICTION OF INFLEXIONAL VELOCITY PROFILES AND BREAKDOWN IN BOUNDARY LAYER TRANSITION
K. D. Thomson Oct. 1973 30 p refs
(WRE-1052(WR/D)) Avail: NTIS HC $4.50

Longitudinal vortices occurring in the laminar boundary layer prior to breakdown which act as flow mixers are discussed. A predominantly inviscid mixing procedure is proposed, use of which permits good estimates to be made of the observed cyclically varying inflexional velocity profiles and which, if continued further, leads to the necessity for an abrupt change in the flow behavior. This is believed to be a manifestation of breakdown. Simulated hydrogen bubble profiles are in good agreement with observed patterns. The mixing process is believed to be of use in explaining transition behind a surface roughness element and also the eruptions which occur near the base of turbulent boundary layers. Author

N74-29643# Technische Hogeschool, Eindhoven (Netherlands).
ON THE INSTABILITY OF A TRANSLATING GAS BUBBLE UNDER THE INFLUENCE OF A PRESSURE STEP
Wilhelmus Adrianus Henricus Johanna Hermans 15 Jun. 1973 115 p refs
Avail: NTIS HC $8.75

The influence of a pressure pulse on a translating bubble is investigated. The liquid is taken as an infinite, incompressible, non-viscous medium. The deviation of the bubble from the spherical form, as a result of translation, is represented by perturbation coefficients of a series of Legendre polynomials. The liquid motion is represented by a velocity potential as a function of the bubble coordinates and velocities. The kinetic and potential energies of the system are calculated, a set of differential equations determining the motion of the bubble shape is derived, using Lagrange's principle. The test facility for observing and filming the interaction of the pressure step and a released air bubble is described. Author

N74-29644# Technischen Universitaet, Hanover (West Germany).
A COMPUTATION PROCEDURE FOR STATIONARY AND NONSTEADY TRANSONIC FLOWS AROUND SLENDER PROFILES Ph.D. Thesis [EIN BERECHNUNGSVERFAHREN FUER STATIONAERE UND INSTATIONAERE SCHALLNAHE STROEMUNGEN UM SCHLANKE PROFILE]
Klaus Heiner Oehmen 1973 142 p refs In GERMAN
Avail: NTIS HC $10.25

Linear inhomogeneous parabolic equations are used to approximate solutions for the transonic flow about profiles. Considered are time invariant stationary flows as well as flows around oscillating profiles. Harmonic analysis and linearization of the problem make it possible to superimpose different oscillation forms for the same slender symmetrical profile in the frictionless flow of an ideal gas. Transl. by G.G.

N74-29645*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
ANALYTICAL AND EXPERIMENTAL STUDY OF MEAN FLOW AND TURBULENCE CHARACTERISTICS INSIDE THE PASSAGES OF AN AXIAL FLOW INDUCER Technical Report, Sep. 1972 - Jul. 1973
C. A. Gorton and B. Lakshminarayana Sep. 1974 187 p refs
(Grant NGL-39-009-007)
(NASA-CR-134682; PSU-Aersp-74-2) Avail: NTIS HC $12.50 CSCL 20D

The effort conducted to gather additional understanding of the complex inviscid and viscid effects existing within the passages of a three-bladed axial flow inducer operating at a flow coefficient of 0.065 is summarized. The experimental investigations included determination of the blade static pressure and blade limiting streamline angle distributions, and measurement of the three components of mean velocity, turbulence intensities and turbulence stresses at locations inside the inducer blade passage utilizing a rotating three-sensor hotwire probe. Applicable equations were derived for the hotwire data reduction analysis and solved numerically to obtain the appropriate flow parameters. Analytical investigations were conducted to predict the three-dimensional inviscid flow in the inducer by numerically solving the exact equations of motion, and to approximately predict the three-dimensional viscid flow by incorporating the dominant viscous terms into the exact equations. The analytical results are compared with the experimental measurements and design values where appropriate. Author

N74-29646# Defence Standards Labs., Maribyrnong (Australia).
AN EXPERIMENTAL STUDY OF THE FLOW IN AN IMPINGEMENT JET
D. B. Prowse May 1974 24 p refs
(Rept-587) Avail: NTIS HC $4.25

A study is presented of an experimental investigation into the flow of a jet of air impinging normally upon a surface close to the nozzle from which the jet emerges. In general the separation between the nozzle and the impingement surface is less than one-tenth the nozzle diameter of 2 mm. Some aspects of the flow are studied using a Mach-Zehnder interferometer and a thin film thermocouple. The cooling effect of the jet is described along with the matching of nozzles for use in pneumatic transducers. Author

N74-29647*# Iowa State Univ. of Science and Technology, Ames. Dept. of Aerospace Engineering.
NUMERICAL COMPUTATION OF TWO-DIMENSIONAL VISCOUS BLUNT BODY FLOWS WITH AN IMPINGING SHOCK Semiannual Progress Report, Dec. - Jun. 1974
John C. Tannehill Jun. 1974 12 p refs
(Grant NGR-16-002-038)
(NASA-CR-138308) Avail: NTIS HC $4.00 CSCL 20D

A time dependent finite difference method used to calculate blunt body flows with impinging shock is reported. The use of the method to predict maximum heat rates and pressure is discussed. Author

N74-29648*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
SHOCK-INDUCED SEPARATION OF ADIABATIC TURBULENT BOUNDARY LAYERS IN SUPERSONIC AXIALLY SYMMETRIC INTERNAL FLOW
Richard J. Page and Morris E. Childs [1974] 26 p refs
(Grant NGR-48-002-047)
(NASA-CR-138303) Avail: NTIS HC $4.50 CSCL 20D

An experimental investigation at Mach 4 of shock-induced turbulent boundary layer separation at the walls of axially symmetric flow passages is discussed, with particular emphasis placed on determining the shock strengths required for incipient separation. The shock waves were produced by interchangeable sting-mounted cones placed on the axes of the flow passages and aligned with the freestream flow. The interactions under study simulate those encountered in axially symmetric engine inlets of supersonic aircraft. Knowledges of the shock strengths required for boundary layer separation in inlets is important since

for shocks of somewhat greater strength rather drastic alterations in the inlet flow field may occur. Author

N74-29649*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
CALCULATION OF TURBULENT SHEAR STRESS IN SUPERSONIC BOUNDARY LAYER FLOWS
Chen-Chih Sun and Morris E. Childs [1974] 15 p refs
(Grant NGR-48-002-047)
(NASA-CR-138302) Avail: NTIS HC $4.00 CSCL 20D

An analysis of turbulent boundary layer flow characteristics and the computational procedure used are discussed. The integrated mass and momentum flux profiles and differentials of the integral quantities are used in the computations so that local evaluation of the streamwise velocity gradient is not necessary. The computed results are compared with measured shear stress data obtained by using hot wire anemometer and laser velocimeter techniques. The flow measurements were made upstream and downstream of an adiabatic unseparated interaction of an oblique shock wave with the turbulent boundary layer on the flat wall of a two dimensional wind tunnel. A comparison of the numerical analysis and actual measurements is made and the effects of small differences in mean flow profiles on the computed shear stress distributions are discussed. Author

N74-29650*# Washington Univ., Seattle. Dept. of Mechanical Engineering.
MEAN AND FLUCTUATING FLOW MEASUREMENTS IN AXISYMMETRIC SUPERSONIC BOUNDARY LAYER FLOW SUBJECTED TO DISTRIBUTED ADVERSE PRESSURE GRADIENTS
Edward Gootzait and Morris E. Childs [1974] 16 p refs
(Grant NGR-48-002-047)
(NASA-CR-139435) Avail: NTIS HC $4.00 CSCL 20D

Measurements have been made of the mean flow properties and turbulent fluctuations in adiabatic turbulent boundary layer flows subjected to distributed adverse pressure gradients. In the freestream region upstream of the adverse pressure gradient the Mach number was 3.86, the unit Reynolds number 5.3 million per foot. The boundary layer developed on the wall of an axisymmetric nozzle and straight test section. In order to avoid the effects of streamwise surface curvature the adverse pressure gradients at the test section wall were induced by contoured centerbodies mounted on the wind tunnel centerline. The flow under study simulated that which might be found in an axially symmetric engine inlet of a supersonic aircraft. Author

N74-29651# National Aerospace Lab., Tokyo (Japan).
METHODS OF DETECTING BOUNDARY LAYER TRANSITION
Nobuhiro Kawai and Yasuo Oguni 1973 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-353) Avail: NTIS HC $4.00

Four methods of detecting boundary layer transition are investigated. Feasibility of measurements on three-dimensional wings in a transonic wind tunnel, and the absence of the flow disturbances due to the sensing elements on the wing are considered. The principles of these methods are as follows: (1) Liquid crystal painted on the wing surface, changes its color according to the recovery temperature, and visualizes transition. (2) Sensitive thermistors mounted flush with the wing surface, indicate the recovery temperature. The measured transition points are compared with theory. (3) Small microphones mounted flush with the surface, indicate the acoustic noise. The sound pressure level of the noise becomes maximum at the point of transition region. (4) Both direct and alternating components of electric currents through the hot films mounted flush with the wing surface, show the characteristic changes of transition and separation. The advantages and disadvantages of these are discussed. The ranges of Mach number and other flow conditions are examined. Author

N74-29652*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLUID CONTROL APPARATUS AND METHOD Patent Application
Charles W. McKee, inventor (to NASA) Issued 30 Nov. 1973 12 p
(NASA-Case-LAR-11110-1; US-Patent-Appl-SN-420424) Avail: NTIS HC $4.00 CSCL 20D

An apparatus for controlling fluids and gases in a zero gravity environment is described. The device consists of a circumnutating chamber which applies centrifugal force in separating gas from liquid. The liquid is forced by the circumnutating motion to travel in a path around the circular wall and periodically past a valve which drains off only the liquid. Gases are removed by a conduit which is protected from fluid droplets by baffles. The construction of the device makes it possible to eliminate seals between the moving parts of the system. P.N.F.

N74-29653*# Stanford Univ., Calif. Thermosciences Div.
THREE DIMENSIONAL TURBULENT BOUNDARY LAYERS: DATA SETS FOR TWO-SPACE COORDINATE FLOWS
A. J. Wheeler and J. P. Johnson Aug. 1972 207 p refs
(Grant NGL-05-020-420)
(NASA-CR-138962; SU-MD-32) Avail: NTIS HC $13.50 CSCL 20D

Sets of data (flows) from eight original sources on three-dimensional turbulent boundary layers were reevaluated and tabulated in a common format. The flows studied were all of the type describable in only two space coordinates, e.g., flow over a swept wing of infinite span. The principal data in each set are profiles of the main and crossflow components of mean velocity. Turbulent shear stress vector profiles were available for two flows, Bradshaw and Terrell (1969) and Johnson (1970). Free stream pressure gradient, wall shear stress coefficient and angle, integral thickness and left and right hand sides of the momentum integral equations were evaluated in a consistent manner for each flow. Author

N74-29654*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF SOUND PROPAGATION IN DUCTS USING THE WAVE ENVELOPE CONCEPT
Kenneth J. Baumeister Washington Jul. 1974 40 p refs
(NASA-TN-D-7719; E-7941) Avail: NTIS HC $3.25 CSCL 20D

A finite difference formulation is presented for sound propagation in a rectangular two-dimensional duct without steady flow for plane wave input. Before the difference equations are formulated, the governing Helmholtz equation is first transformed to a form whose solution does not oscillate along the length of the duct. This transformation reduces the required number of grid points by an order of magnitude, and the number of grid points becomes independent of the sound frequency. Physically, the transformed pressure represents the amplitude of the conventional sound wave. Example solutions are presented for sound propagation in a one-dimensional straight hard-wall duct and in a two-dimensional straight soft-wall duct without steady flow. The numerical solutions show evidence of the existence along the duct wall of a developing acoustic pressure diffusion boundary layer which is similar in nature to the conventional viscous flow boundary layer. In order to better illustrate this concept, the wave equation and boundary conditions are written such that the frequency no longer appears explicitly in them. The frequency effects in duct propagation can be visualized solely as an expansion and stretching of the suppressor duct. Author

N74-29655*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL AND ANALYTICAL SONIC NOZZLE DISCHARGE COEFFICIENTS FOR REYNOLDS NUMBERS UP TO 8 X 10 TO THE 6th POWER
Andrew J. Szaniszlo 1974 15 p refs Proposed for presentation at the Winter Ann. Meeting of the Am. Soc. of Mech. Engr., New York, 17-22 Nov. 1974
(NASA-TM-X-71595; E-8053) Avail: NTIS HC $3.00 CSCL 20D

Sonic discharge coefficients are presented for two different geometry flow nozzles using nitrogen gas at high pressures where real gas corrections are significant. Throat Reynolds number range extended up to 8 million. Experimentally obtained coefficients for a nozzle with a continuous and finite radius of curvature agreed with those obtained analytically to within 0.2 percent. Experimental coefficients for a long radius ASME nozzle agreed

to within 1/4 percent to an empirical equation representing the most probable subsonic discharge coefficient. Author

N74-29656*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INVESTIGATION OF THE STALL-INDUCED SHOCK WAVE (HAMMERSHOCK) AT THE INLET TO THE ENGINE
Anatole P. Kurkov, Ronald H. Soeder, and John E. Moss 1974 27 p refs Presented at the Symp. on Propulsion System Structural Integration and Eng. Integrity, Monterey, Calif., 3-6 Sep. 1974
(NASA-TM-X-71594; E-8051) Avail: NTIS HC $3.25 CSCL 20D

The peak static pressures measured at the inlet to the engine during stall are presented for a turbojet and two turbofan engines. It is shown for one turbofan and the turbojet that the static pressure ratio across the hammershock does not exceed significantly the normal shock pressure ratio necessary to stop the flow. The second turbofan engine did not follow this rule. Possible reasons for the departure are discussed. For the two turbofan engines the influence of the stall method on the hammershock intensity was investigated. Data related to the spatial distribution of pressure in the hammershock are also presented. Author

N74-29657# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorentwicklung.
PROCEDURE FOR THE DIRECT NUMERICAL SIMULATION OF TURBULENT FLOWS IN PLANE CHANNELS AND ANNULI AND ITS APPLICATION IN THE DEVELOPMENT OF TURBULENCE MODELS
U. Schumann Oct. 1973 257 p refs In GERMAN; ENGLISH summary
(KFK-1854) Avail: AEC Depository Libraries HC $15.00

A numerical difference scheme is described to simulate three-dimensional, time-dependent, turbulent flows of incompressible fluids at high Reynolds numbers in a plane channel and in concentric annuli. Starting from the results of Deardorff, the Navier-Stokes equations averaged over grid volumes, are integrated. For description of the subgrid scale motion a model has been developed which takes into account strongly inhomogeneous turbulence and grid volumes of unequal side lengths. The premises used in the model are described and discussed. Stability criteria are established for this method and for similar difference schemes. For computation of the pressure field the appropriate Poisson's equation is solved accurately, except for rounding errors, by fast Fourier transform. The procedure implemented in the TURBIT-I program is used to simulate turbulent flows in a plane channel and an annulus of 5:1 ratio of radii. Author (NSA)

N74-29658# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Dept. de Physique du Plasma et de la Fusion Controlee.
DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION OF AN AEROSOL USING A DIFFUSION BATTERY
J. P. Maigne Feb. 1974 104 p refs In FRENCH
(CEA-R-4549) Avail: AEC Depository Libraries HC $7.25

The principal methods for the treatment of concentration measurements both upstream and downstream of a diffusion battery are reviewed and discussed, the purpose of the measurements being the determination of the aerosol particle size distribution. It is then demonstrated that the resolution of the equations arising from the problem leads to the imposing of physical constraints on the distribution sought, these constraints being more and more restrictive with increasing experimental inaccuracies. An algorithm is proposed, which provides an approximate solution to the system of equations, certain predetermined criteria, and the constraints imposed on the distribution being taken into account. Author (NSA)

N74-29659# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Reaktortechnik.
LAMINAR BOUNDARY LAYERS, THE ANALOGY RELATIONS BETWEEN HEAT TRANSFER AND MASS TRANSFER AND THEIR APPLICABILITY TO LIQUID METAL CORROSION
N. Schwarz Sep. 1973 23 p refs In GERMAN; ENGLISH summary
(SGAE-2174) Avail: AEC Depository Libraries HC $3.00

A literature survey of the formulas of the laminar hydraulic sublayer in laminar and turbulent flow conditions is presented. The heat and mass transfer analogy is discussed and restrictions with respect to liquid-metal corrosion are summarized. By interpreting experimental results it can be shown that the thickness of the laminar sublayer should be responsible for some effects of mass transfer phenomena. Nevertheless, because of insufficient knowledge of relevant physical properties, it is impossible to deduce analogy relations that describe the measured weight losses quantitatively. Author (NSA)

N74-29660# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INFLUENCE OF HEATING LOW PRESSURE GAS IN A SHOCK TUBE ON THE INCREASE OF THE ATTAINABLE STAGNATION TEMPERATURE
G. L. Grodzovskii 10 Apr. 1974 8 p refs Transl. into ENGLISH from Uch. Zap. Tsentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 2, 1970 p 101-103
(AF Proj. G101)
(AD-778586; FTD-HT-23-1169-74) Avail: NTIS CSCL 20/4

The problem of increase of the attainable stagnation temperature of the gas flow in a shock tube is investigated. It is shown that for this purpose the heating of low pressure gas is advisable. There is analyzed the effect of heating of low pressure gas on the increase of the attainable stagnation temperature in flow behind the shock wave for the case of a single-diaphragm cylindrical shock tube. GRA

N74-29661# Advanced Technology Center, Inc., Dallas, Tex.
DRAG-REDUCING POLYMER MOLECULAR WEIGHT EFFECTS ON TURBULENT DIFFUSION FOR UNIFORMLY DISTRIBUTED POLYMER INJECTION Interim Report
R. R. Walters Mar. 1974 66 p refs
(Contract N00014-69-C-0214)
(AD-778709; B-94300/4CR-11) Avail: NTIS CSCL 20/4

The effect of polymer molecular weight on turbulent diffusion and drag-reduction was investigated over a uniformly distributed polymer injection area. The purpose of the experiments, carried out in a porous wall pipe flow facility, was to determine optimum values of polymer molecular weight and injection mass flux for attaining maximum skin-friction reduction over a distributed injection area and to investigate associated turbulent diffusion characteristics. It was found for this type of polymer supply system, which provided polymer directly to the required wall shear stress region, that the optimum molecular weight was approximately an order of magnitude less than that normally used in skin-friction reduction applications with homogeneous solutions and localized injection. (Modified author abstract) GRA

N74-29662# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
SOLUTION OF THE HYPERSONIC VISCOUS SHOCK LAYER EQUATIONS FOR FLOW PAST A PARABOLOID
B. N. Srivastava, M. J. Werle, and R. T. Davis Apr. 1974 65 p refs
(Contract N00014-72-A-0027)
(AD-779330; AFL-74-4-10) Avail: NTIS CSCL 20/4

Numerical solutions to the full viscous shock layer equations are presented for hypersonic flow past a paraboloid. Solutions were obtained using an implicit finite difference scheme coupled with an iterative relaxation process for determining the bow shock shape. Account is taken of the usually ignored convective terms in the normal momentum equation. The numerical solutions are compared with experimental data at M + 10 and 18 for free stream Reynolds numbers, Re from 44 to 12700. These comparisons are used as a basis for assessing the influence on the predicted results of the gas model (perfect gas or binary mixture), the slip conditions. Evidence is found that the gas model has little influence on the results, the two slip models studied expressed minor differences in the results, and that the values of the slip constants cause significant changes for cold wall conditions only in the stagnation region surface properties. Author (GRA)

N74-29663# Cincinnati Univ., Ohio. Dept. of Mechanical Engineering.
A NUMERICAL METHOD FOR BOUNDARY LAYER EQUATIONS
R. H. Nilson and Y. G. Tsuei Mar. 1974 73 p refs
(Contract DAHC04-69-C-0016)
(AD-779507; AROD-T-4-59-E; Rept-74-41) Avail: NTIS CSCL 20/4

A general marching procedure for numerical solution of the two-dimensional boundary layer equations is presented. Although the present method traces its origin to that of Patankar and Spalding, major modifications have been undertaken. The method is tested for a variety of laminar flow configurations including wedge flows, incompressible flow on a flat plate at various Eckert numbers, compressible flow on an adiabatic flat plate at various Mach numbers, flow over a cylinder, uniform suction on a flat plate, and Howarth flow. The results show excellent agreement with solutions by other methods, even when as few as fifteen grid lines are used. A separate report entitled Film Cooling by Oblique Slot Injection presents results for a variety of injection configurations which show the effects of coolant mass flow rate, injection angle, boundary layer thickness, slot width, and multiple slots. (Modified author abstract) GRA

N74-29664# Weapons Research Establishment, Salisbury (Australia).
A NUMERICAL SOLUTION FOR SUPERSONIC FLOW AROUND A CONE AT SMALL ANGLES OF ATTACK
D. L. Thomson Feb. 1974 25 p
(PB-231905/1; WRE-TN-1138) Avail: NTIS HC $4.25 CSCL 20D

The document describes a method for finding the supersonic flow around a right circular cone at small angles of attack for a ratio of specific heats varying from 9/7, the triatomic value, to 5/3, the monatomic value. The equations are due to Sims and follow from the work of Ferri. The approach is similar to that outlined by Sims, a Runge Kutta method being used for the numerical integration. A FORTRAN 2 program for calculating flow properties, given the cone angle and Mach number, is presented. GRA

N74-29665# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
NONLINEAR STABILITY OF LIQUID FILM ADJACENT TO A VISCOUS SUPERSONIC STREAM
Gary L. Bordner and Ali Hasan Nayfeh Apr. 1974 61 p refs
(Contract N00014-72-A-0136-0002; NR Proj. 061-201)
(AD-779247; VPI-E-74-11) Avail: NTIS CSCL 20/4

The nonlinear stability of a liquid film adjacent to a viscous supersonic gas stream is investigated. The gas is assumed to exert a mean shear stress at the liquid/gas interface which in turn establishes a linear mean velocity profile in the liquid. The shear and pressure perturbations exerted by the gas on the liquid are calculated by taking into account the gas viscosity and mean velocity profile. The problem is formulated within the long wave approximation and solutions are obtained for small but finite amplitudes and for small and moderate liquid Reynolds number. The predicted wavenumbers are found to be in good agreement with those observed over wedge and cone shaped models in laminar supersonic wind tunnels. The analysis is incapable of predicting the observed amplitudes, wave speeds and frequencies. Author (GRA)

N74-29666# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
VALVE AND ORIFICE CAVITATION INCEPTION SIGMA SCALE EFFECTS
F. G. Hammitt Mar. 1974 28 p refs Sponsored in part by ANL
(Grant NSF GK-1889)
(PB-230645/4; UMICH-01357-25-I) Avail: NTIS HC $4.50 CSCL 20D

Three cavitation sigma parameters, common for various types of flow devices, are compared, particularly for the purpose of converting the sigma form often utilized for valves and orifices into forms conventionally used for hydrofoils (and other forms of submerged objects) and venturis. Conversion relations between these sigma are derived. Using empirical results for valves and orifices, substantial scale effects in terms of that form of sigma appropriate for valves are shown in terms of size, pressure, and velocity changes. GRA

N74-29667# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
CAVITATION THRESHOLD AND SUPERHEAT IN VARIOUS FLUIDS
Frederick G. Hammitt, Andreas Keller, O. S. M. Ahmed, J. J. Pyun, and E. Yilmaz Jan. 1974 34 p refs
(Grant NSF GK-1889)
(PB-228096/4; UMICH-01357-35-T) Avail: NTIS HC $4.75 CSCL 20D

Comparisons are made between cavitation thresholds in sodium (and other liquid metals) and water in identical machines, particularly pumps, in all cases known to the authors where such measurements were made. It is generally concluded that there is little significant difference between these liquids in regard to cavitation threshold from an engineering viewpoint. However, there is much data scatter in all fluids, which becomes important in certain special cases, e.g., sodium superheat for sodium cooled fast breeder reactors. It is concluded that the scatter can only be resolved, and further, and further progress made, if detailed measurements of entrained gas nuclei (which are the presumed source of cavitation bubbles) be made for all fluids concerned. (Modified author abstract) (GRA)

N74-29668# Wisconsin Univ., Madison. Dept. of Mathematics.
CONTRIBUTIONS OF THE THEORY OF SURFACE WAVES ON A VISCOUS FLUID Ph.D. Thesis
Shy-Ming Shih 1973 148 p refs
(Contract DI-14-31-0001-3250)
(PB-227457/9; OWRR-A-037-WIS(8); W74-03901) Avail: NTIS HC $10.50 CSCL 20D

Surface waves in a viscous incompressible fluid with surface tension in an inclined open channel of arbitrary cross section were studied. Both linearized and nonlinear problems are considered. An abstract approach based upon the theory of Hilbert spaces is adopted to investigate the linearized problem, and a perturbation method is used to study the nonlinear problem. The unique solvability of the linearized Navier-Stokes equations is proved by using the Galerkin's method. Centering around the concept of a critical speed of the surface wave, a singular perturbation scheme within the framework of long wave approximation is developed to study the asymptotic behavior of nonlinear surface waves in the channel. A critical Reynolds number is then obtained from this scheme as a criterion for the stability of the wave motion. (Modified author abstract) GRA

N74-29669# Army Foreign Science and Technology Center, Charlottesville, Va.
SURFACE WAVES OF A VISCOUS FLUID OF INFINITE DEPTH DUE TO TANGENTIAL STRESSES
A. K. Nikitin and S. A. Podrezov 3 Nov. 1973 10 p refs Transl. into ENGLISH from Materialy Konferentsii po Kraevym Zadachem (USSR), 1970 p 192-198
(AD-779597; FSTC-HT-23-2593-72) Avail: NTIS CSCL 20/4

The paper examines a three-dimensional linear problem concerning gravitational waves on the surface of viscous fluid of infinite depth. GRA

N74-29670# Dayton Univ., Ohio.
IMPROVED METHODS FOR SOLVING THE SMALL DISTURBANCE EQUATIONS Final Report, Sep. 1972 - Apr. 1973
Louis I. Boehman Nov. 1973 39 p refs
(Contract F33615-72-C-2193; AF Proj. 1366)
(AD-779730; AFFDL-TR-73-113) Avail: NTIS CSCL 20/4

The existence of a new class of boundary layer oscillations reported by G.S. Raetz in 1966 and again in 1970 for the laminar boundary layer on a flat plate at zero incidence was investigated. (Modified author abstract) GRA

N74-29671# Douglas Aircraft Co., Inc., Long Beach, Calif.
A GENERAL METHOD FOR CALCULATING THREE-DIMENSIONAL INCOMPRESSIBLE LAMINAR AND TURBULENT BOUNDARY LAYERS. 2: THREE-

DIMENSIONAL FLOWS IN CARTESIAN COORDINATES Final Report, Jan. 1973 - Mar. 1974
Tuncer Cebeci Mar. 1974 37 p refs
(Contract N00014-72-C-0111; SR0090101)
(AD-779616; MDC-J6517) Avail: NTIS CSCL 20/4

The report presents a general method for computing three-dimensional laminar and boundary-layer flows in Cartesian coordinates. In the equations, the Reynolds shear stress terms are modeled by an eddy-viscosity formulation developed by the author. A very efficient two-point finite-difference method was used to solve the governing equations. The accuracy of the method is investigated for laminar and turbulent flows.
Author (GRA)

N74-29672# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.
WIND TUNNEL TESTS OF NEGATIVELY BOUYANT PLUMES Final Report
T. G. Hoot, R. N. Meroney, and J. A. Peterka Oct. 1973 105 p refs
(Grant PHS-AP-01186)
(PB-231590/1; RNM-JAP-13) Avail: NTIS HC $8.25 CSCL 04B

The results of tests made of negatively buoyant emissions into a quiescent medium, laminar cross-wind and turbulent boundary layer conducted in a wind tunnel are reported. Measurements include the maximum rise height, horizontal point of descent and behavior of emission characteristics. GRA

N74-29673# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
MOTION OF A SPHERICAL PARTICLE IN A TURBULENT FLOW Interim Report
Prem K. Khosla and Samuel Lederman Nov. 1973 31 p refs
(Contract DAHC04-69-C-0077; ARPA Order 1442)
(AD-779541; PIBAL-73-22) Avail: NTIS CSCL 20/4

Motion of a particle in a turbulent fluid is examined. A relaxation process is introduced to incorporate the difference in particle and the fluid diffusivities. The effect of the reduction in the diffusivity ratio, changes in temperature and density of the fluid, and the presence of various size particles are examined. It is shown that each of these factors may limit the applicability of the LDV to low Mach number and low frequency turbulence.
Author (GRA)

N74-29674# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
STATISTICAL PROBLEMS CONNECTED WITH ASYMPTOTIC SOLUTIONS OF THE ONE-DIMENSIONAL NONLINEAR DIFFUSION EQUATION Interim Report
J. M. Burgers Nov. 1973 301 p refs
(Grant AF-AFOSR-0141-66; AF Proj. 9781)
(AD-779760; AFOSR-74-0786TR; Lecture-Ser-52) Avail: NTIS CSCL 20/4

The topic treated in the report is a distant outcome of old attempts to arrive at a statistical theory of turbulent fluid motion, modeled after the example of classical statistical mechanics as applied to the kinetic theory of gases. The attempts did not bring the desired success, but they made clear that essential features of the spectrum of turbulence are due to the simultaneous presence of dissipative as well as nonlinear inertial terms in the equations of motion. It seemed attractive therefore to study the interaction between these terms in an extremely simplified equation, the one-dimensional nonlinear diffusion or heat flow equation: (U sub t) + u(u sub x) = nu (u sub xx). The study proved to have an interest of itself, and a set of results referring to asymptotic solutions, corresponding to vanishing viscosity and large values of t, is described in the report. GRA

N74-29675# General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
FLUIDIC ROLL RATE CONTROL SYSTEM FOR HIGH ACCELERATION TERMINAL HOMING MISSILES Final Report, 15 Mar. 1972 - 15 Apr. 1974
Robert W. Young Apr. 1974 111 p
(Contract DAAH01-72-C-0620)
(AD-779634; DOC-74SD2053) Avail: NTIS CSCL 16/4

A technology study effort was conducted to demonstrate the feasibility of a fluidic roll rate control for high acceleration terminal homing missiles. The fluidic system developed under this contract contained a Laminar Angular Rate Sensor (LARS), laminar proportional gain block, turbulent proportional amplifier, digital logic elements, low pressure diaphragm amplifier, high pressure power interface valve, bi-directional variable thrust nozzles, cold gas supply, solid propellant warm gas generator, and pressure regulation system. The cold gas supply was used to power the fluidic components and to control the variable thrust nozzle's curtain and direction. A separate cold gas supply rather than the available warm gas generator supply was used because of the amount of contaminants in the gases derived from solid propellants. System and component requirement definition, component design and testing, major subsystems assembly and test, system integration and assembly into the missile housing, and system test and evaluation were accomplished under this contract. (Modified author abstract) GRA

N74-29676# Wisconsin Univ., Madison. Mathematics Research Center.
MECHANICS AND THERMODYNAMICS OF A MIXTURE OF A GRANULAR MATERIAL WITH A FLUID Summary Report
S. L. Passman Apr. 1974 35 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-779401; MRC-TSR-1391) Avail: NTIS CSCL 12/1

Constitutive equations are postulated for a mixture of a granular material and a fluid. Consequences of the entropy inequality, for both linear and nonlinear constitutive equations, are derived. Author (GRA)

N74-29677# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE FLOW BETWEEN TWO COUNTER-ROTATING INFINITE PLANE DISKS Technical Summary Report
J. B. McLeod and Seymour V. Parter Apr. 1974 50 p refs
(Contracts DA-31-124-ARO(D)-462; N00014-67-A-0128-0004)
(AD-779419; MRC-TSR-1414) Avail: NTIS CSCL 20/4

The paper studies the boundary-value problem arising from the bahaviour of a fluid occupying the region-1 < or=x < or= 1 between two rotating disks, rotating about a common axis perpendicular to their planes when the disks are rotating with the same speed but in the opposite sense. (Modified author abstract) GRA

N74-29678# Naval Ship Research and Development Center, Bethesda, Md.
A MODIFIED FROUDE METHOD FOR DETERMINING FULL-SCALE RESISTANCE OF SURFACE SHIPS FROM TOWED MODELS
Paul S. Granville Jul. 1973 32 p refs
(AD-766431; NSRDC-4201) Avail: NTIS CSCL 20/4

The Froude method for extrapolating the resistance of towed ship models to full-scale conditions has been modified with respect to the prediction of viscous resistance from an equivilent flat-plate resistance. A form factor for extrapolation is to be determined from a boundary-layer calculation of a uniquely defined equivalent body of revolution. Examples of form factors calculated for the Lucy Ashton and a hull with a block coefficient of 0.8 are discussed. Author (GRA)

N74-29679# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL SETUP FOR STUDYING COMPLEX HEAT EXCHANGE
A. N. Boiko, V. M. Eroshenko, I. A. Sakharova, V. N. Kholodilov, and L. A. Yaskin 30 Apr. 1974 13 p refs Transl. into ENGLISH from the book "Teplofizicheskie Svoistva i Gazodinamika Vyskotemperaturnykh Sred" 1972 p 85-90
(AF Proj. G101)
(AD-778569; FTD-HT-23-799-74) Avail: NTIS CSCL 20/4

A bi-ellipsoid mirror arrangement focuses a xenon radiation source in a high temperature optical furnace for studying ablation characteristics of materials. G.G.

N74-29680# Texas Univ., Austin. Electronics Research Center.
TEMPORAL REFERENCE LINE HOLOGRAMS FROM A

WATER SURFACE
Jerome Knopp and Elmer L. Hixson 11 Oct. 1973 64 p refs (Contract F44620-71-C-0091; AF Proj. 4751)
(AD-778482; TM-40; AFOSR-74-0579TR) Avail: NTIS

A new area for the application of holographic techniques has been investigated. A point source radiator located on the two-dimensional plane formed by an air-water interface was imaged using holography. A schlieren photograph was taken of the surface pattern produced by a radiating point source of capillary waves on water. Temporal reference line holograms were removed from the photographed pattern using a slit-shaped mask. Reconstructed images were formed in the converging beam of a helium-neon laser. The images were observed on a vidicon screen through a closed circuit television monitor. A theoretical study of capillary waves was made and some experiments were conducted in the generation and observation of these waves. Some suggestions are made to apply this new development to two-dimensional wave structures. Author (GRA)

N74-29872* Kanner (Leo) Associates, Redwood City, Calif.
RESEARCH ON DECREASING THE NOISE OF A JET
M. E. Akelis, L. P. Bastite, and V. K. Naynis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 308-310 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 276-277 (For availability see N74-29785 19-15)
CSCL 20D

N74-29913* Lockheed Missiles and Space Co., Huntsville, Ala.
FLUID MOTIONS IN A LOW-G ENVIRONMENT
P. G. Grodzka, S. V. Bourgeois, M. R. Brashears, and L. W. Spradley *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 691-727 refs (For availability see N74-29905 19-15)
CSCL 20D

N74-29917* Bell Telephone Labs., Inc., Murray Hill, N.J.
STUDIES OF LIQUID FLOATING ZONES ON SL-IV, THE THIRD SKYLAB MISSION
J. R. Carruthers *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 837-856 refs (For availability see N74-29905 19-15)
CSCL 20D

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-29681 American Univ., Washington, D.C.
ALGEBRAICALLY SPECIAL METRICS IN THE SOLUTION OF PROBLEMS IN GENERAL RELATIVITY AND GRAVITATION Ph.D. Thesis
Charles Sheffield 1973 104 p
Avail: Univ. Microfilms Order No. 74-14248

The concept of algebraically special space-times is used to explore the solution of problems in general relativity. An elementary analysis is given relating alternate methods of classifying space-times, followed by a systematic analysis and solution of the vacuum field equations for a wide class of algebraically special space-times. Rotating solutions of the non-vacuum case are analyzed in the limit of slow rotation and their application to stellar models is described. Dissert. Abstr.

N74-29682*# Institut Francais du Petrole, Rueil-Malmaison.
STUDY GEOMORPHOLOGY, PAST AND PRESENT, LINEAR TRENCH, TECTONICS RELATIONSHIP BETWEEN PYRENEES AND ALPS Final Report, Jul. 1972 - Apr. 1974
Jacques Guillemot, Principal Investigator Apr. 1974 25 p refs Sponsored by NASA ERTS
(E74-10568; NASA-CR-138869) Avail: NTIS HC $4.25 CSCL 08G

The author has identified the following significant results. ERTS-1 images obviously show up some large linear features trending N 80 E or N 30 E common to both Alps and Pyrenees. One of them, the Ligurian Fault, had been previously forecast by Laubscher in an interpretation of the Alps by the plate tectonic theory, but it extends westward farthest from the Alps, cutting the Pyrenees axis. These lineaments have been interpreted as reflections of deep seated wrench faults in the surficial part of the sedimentary series. A large set of such lineaments is perceptible in western Europe, such as the Guadalquivir Fault in southern Spain, Ligurian Fault, Insubrian Fault, Northern-Jura Fault, Metz Fault. Perhaps these may be interpreted as transform faults of the mid-Atlantic ridge or of a paleo-rift seated in the Rhine-Rhone graben.

N74-29683*# Institut Francais du Petrole, Rueil-Malmaison.
DYNAMIC BEHAVIOUR OF COASTAL SEDIMENTATION IN THE LIONS GULF Final Report, Dec. 1972 - Mar. 1974
Max Guy, Principal Investigator Apr. 1974 49 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10576; NASA-CR-138870) Avail: NTIS HC $5.50 CSCL 08C

The author has identified the following significant results. A number of ERTS-1 images covering this geographical zone were studied and compared with cartographic maps, air photographs, and thermal-IR images. Old and recent sediments leave traces in the landscape which are decoded by interpreting the shapes of the clear zones forming a network against the black background representing water and humid zones. Current sedimentation and its mechanism were investigated. It had been hoped that a regular sequence of images would make it possible to follow the dynamics of the Rhone and the coastal rivers in relation to meteorological conditions. In any event only a small number of images spread over a wide period of time were obtained, and a complete study was therefore impossible. However, in comparing some of the ERTS-1 images certain thermal-IR images and information on the flow of the Rhone provided some clarification of mechanisms associated with river dynamics.

N74-29684*# Iowa Univ., Iowa City. Dept. of Geology.
EXPERIMENT TO EVALUATE FEASIBILITY OF UTILIZING SKYLAB-EREP REMOTE SENSING DATA FOR TECTONIC ANALYSIS OF THE BIGHORN MOUNTAINS REGION, WYOMING-MONTANA Quartely Progress Report, 1 Apr. - 30 Jun. 1974
Richard A. Hoppin, Principal Investigator 11 Jul. 1974 2 p EREP
(Contract NAS9-13313)
(E74-10599; NASA-CR-138708) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-29685*# National Oceanic and Atmospheric Administration, Rockville, Md. Photogrammetric Research Branch.
SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 15 Apr. - 15 Jul. 1974
Morton Keller, Principal Investigator 15 Jul. 1974 1 p EREP (NASA Order T-4110-B)
(E74-10643; NASA-CR-138825) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-29686*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Jun. 1974
George A. Maul, Principal Investigator Jun. 1974 2 p EREP (NASA Order T-4713-B)
(E74-10654; NASA-CR-138887; MPR-12) Avail: NTIS HC $4.00 CSCL 08J

There are no author-identified significant results in this report.

N74-29687*# Delaware Univ., Newark. Coll. of Marine Studies.
A NEW DEVICE FOR ACQUIRING GROUND TRUTH ON THE ABSORPTION OF LIGHT BY TURBID WATERS Report on Significant Results
V. Klemas, Principal Investigator, R. Srna, and W. Treasure 26 Jul. 1974 2 p ERTS
(Contract NAS5-21837)
(E74-10655; NASA-CR-138886) Avail: NTIS HC $4.00 CSCL 08H

The author has identified the following significant results. A new device, called a Spectral Attenuation Board, has been designed and tested, which enables ERTS-1 sea truth collection teams to monitor the attenuation depths of three colors continuously, as the board is being towed behind a boat. The device consists of a 1.2 x 1.2 meter flat board held below the surface of the water at a fixed angle to the surface of the water. A camera mounted above the water takes photographs of the board. The resulting film image is analyzed by a microdensitometer trace along the descending portion of the board. This yields information on the rate of attenuation of light penetrating the water column and the Secchi depth. Red and green stripes were painted on the white board to approximate band 4 and band 5 of the ERTS MSS so that information on the rate of light absorption by the water column of light in these regions of the visible spectrum could be concurrently measured. It was found that information from a red, green, and white stripe may serve to fingerprint the composition of the water mass. A number of these devices, when automated, could also be distributed over a large region to provide a cheap method of obtaining valuable satellite ground truth data at present time intervals.

N74-29688*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 1-30 Jun. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 30 Jun. 1974 3 p EREP
(Contract NAS9-13357)
(E74-10656; NASA-CR-138888; MR-11) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-29689*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 1-31 May 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 31 May 1974 3 p EREP
(Contract NAS9-13357)
(E74-10657; NASA-CR-138889; MR-10) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-29690*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 1-31 Mar. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 31 Mar. 1974 3 p EREP
(Contract NAS9-13357)
(E74-10659; NASA-CR-138891; MR-8) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-29691*# Stanford Univ., Calif. Remote Sensing Lab.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, 1-28 Feb. 1974
R. J. Lyon and F. R. Honey, Principal Investigators 28 Feb. 1974 3 p EREP
(Contract NAS9-13357)
(E74-10660; NASA-CR-138892; MR-7) Avail: NTIS HC $4.00 CSCL 08G

There are no author-identified significant results in this report.

N74-29692*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
[ACQUISITION AND PROCESSING OF DATA FROM THE SL-2 MISSION (EREP PASS NO. 7) OVER THE LAKE MONROE, INDIANA TEST SITE] Yearly Report, Jul. 1973 - Jun. 1974
LeRoy F. Silva, Principal Investigator 26 Jul. 1974 4 p EREP
(Contract NAS9-13301)
(E74-10661; NASA-CR-138893) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-29693*# Geological Survey, Reston, Va.
AN EXPERIMENT IN CULTURAL INTERPRETATION AND MAP REVISION FROM SKYLAB DATA Progress Report, 1 Nov. 1973 - 1 Jul. 1974
William J. Kosco, Principal Investigator 1 Jul. 1974 3 p ERTS
(NASA Order S-70243-AG)
(E74-10662; NASA-CR-138894) Avail: NTIS HC $4.00 CSCL 08B

The author has identified the following significant results. S190-A imagery is suitable for input to map compilation and revision at scales from 1:1,000,000 to 1:250,000.

N74-29694*# Maine Dept. of Transportation, Augusta. Bureau of Highways.
DEVELOP A LAND USE-PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Final Report, May 1972 - Mar. 1974
Ernest G. Stoeckeller, Principal Investigator, Robert S. Farrell, and Raymond G. Woodman 15 Mar. 1974 61 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21772)
(E74-10663; NASA-CR-139037) Avail: NTIS HC $6.25 CSCL 13B

The author has identified the following significant results. Based on the detail study of the Sunkhaze Stream Watershed, it is believed that good detailed drainage studies can be derived from repetitive ERTS imagery. Land use maps tailored to hydrologic study can be prepared from ERTS imagery. Significant changes in the Sunkhaze Stream and Otter Stream Watersheds at spring flood conditions have given important information on the causes for flooding in the town of Bradley.

N74-29695*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report, 1 Mar. - 31 May 1974
Frederick J. Thomson, Principal Investigator 17 Jul. 1974 3 p EREP
(Contract NAS9-13272)
(E74-10664; NASA-CR-138896; ERIM-101700-15-L; QPR-5) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-29696*# Maine Dept. of Transportation, Augusta. Bureau of Highways.
MAP THE DISTRIBUTION OF GLACIOFLUVIAL DEPOSITS AND ASSOCIATED GLACIAL LANDFORMS Final Report, May 1972 - Nov. 1973
Raymond G. Woodman, Principal Investigator and Ernest G. Stoeckeller 28 Nov. 1973 42 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contracts NAS5-21747; NAS5-21772; NAS5-21724)
(E74-10665; NASA-CR-139040) Avail: NTIS HC $5.25 CSCL 08B

There are no author-identified significant results in this report.

N74-29697*# Clemson Univ., S.C. Dept. of Horticulture.
CROP STATUS EVALUATIONS AND YIELD PREDICTIONS Monthly Progress Report, 1 May - 1 Jun. 1974
J. R. Haun, Principal Investigator 6 Jun. 1974 7 p EREP
(Contract NAS9-14006)
(E74-10666; NASA-CR-138996) Avail: NTIS HC $4.00 CSCL 02C

There are no author-identified significant results in this report.

N74-29698*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Bimonthly Progress Report, 16 May - 15 Jul. 1974
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 22 Jul. 1974 9 p EREP
(NASA Order T-4106-B)
(E74-10668; NASA-CR-139240; BMPR-12) Avail: NTIS HC $4.00 CSCL 02F

There are no author-identified significant results in this report.

N74-29699*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
NEW ENGLAND RESERVOIR MANAGEMENT: LAND USE/VEGETATION MAPPING IN RESERVOIR MANAGEMENT (MERRIMACK RIVER BASIN) Interim Contract Report
Saul Cooper, Principal Investigator, Harlan L. McKim, Lawrence W. Gatto, Carolyn J. Merry, Duwayne M. Anderson, and Thomas L. Marlar 14 Jun. 1974 30 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(NASA Order T-4646-B)
(E74-10669; NASA-CR-139239) Avail: NTIS HC $4.50 CSCL 08B

The author has identified the following significant results. It is evident from this comparison that for land use/vegetation mapping the S190B Skylab photography compares favorably with the RB-57 photography and is much superior to the ERTS-1 and Skylab 190A imagery. For most purposes the 12.5 meter resolution of the S190B imagery is sufficient to permit extraction of the information required for rapid land use and vegetation surveys necessary in the management of reservoir or watershed. The ERTS-1 and S190A data products are not considered adequate for this purpose, although they are useful for rapid regional surveys at the level 1 category of the land use/vegetation classification system.

N74-29700*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL] Monthly Progress Report, Jun. 1974
Victor I. Myers, Principal Investigator 20 Jul. 1974 2 p EREP
(Contract NAS9-13337)
(E74-10670; NASA-CR-139238) Avail: NTIS HC $4.00 CSCL 05B

There are no author-identified significant results in this report.

N74-29701*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Interim Final Report, May 1973 - Apr. 1974
David T. Chang, Principal Investigator Apr. 1974 18 p refs EREP
(Contract NAS9-13343)
(E74-10672; NASA-CR-139236) Avail: NTIS HC $4.00 CSCL 04A

There are no author-identified significant results in this report.

N74-29702*# Northern Prairie Wildlife Research Center, Jamestown, N. Dak.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Jul. 1974
Harvey K. Nelson, Principal Investigator Jul. 1974 2 p EREP
(NASA Order T-4114-B)
(E74-10673; NASA-CR-138967) Avail: NTIS HC $4.00 CSCL 06C

There are no author-identified significant results in this report.

N74-29703*# Allied Research Associates, Inc., Baltimore, Md.
THE NIMBUS 5 DATA CATALOG. VOLUME 1: DATA ORBITS 104 THROUGH 693, 19 DECEMBER 1972 - 31 JANUARY 1973
May 1973 312 p
(Contract NAS5-21617)
(NASA-CR-139036) Avail: NTIS HC $18.75 CSCL 04A

Nimbus 5 was successfully launched from the Western Test Range at Vandenburg AFB, California, into a near circular orbit (1089 km x 1102 km) at 07 hr 56 min 00 sec GMT on 11 December 1972. All experiments and subsystems were successfully turned on. Satellite operations from launch (11 December) through orbit 103 (18 December) consisted of engineering evaluation of all spacecraft systems. As a result of that effort, data reception, accountability, and processing were intermittent during that period. Therefore, this catalog reflects documentation from orbit 104 (19 December 1972) through orbit 693 (31 January 1973). The pitch bias history, surface composition mapping radiometer, and infrared temperature profile radiometer are discussed. Author

N74-29704*# Tennessee Univ., Knoxville. Civil Engineering Dept.
EFFECTS OF ATMOSPHERIC AEROSOLS ON SCATTERING REFLECTED VISIBLE LIGHT FROM EARTH RESOURCE FEATURES Final Report
Kenneth E. Noll, , Bruce A. Tschantz, and Wayne T. Davis 31 Dec. 1972 92 p refs
(Grant NGL-43-001-021)
(NASA-CR-139382) Avail: NTIS HC $7.75 CSCL 04A

The vertical variations in atmospheric light attenuation under ambient conditions were identified, and a method through which aerial photographs of earth features might be corrected to yield quantitative information about the actual features was provided. A theoretical equation was developed based on the Bouguer-Lambert extinction law and basic photographic theory. Author

N74-29705# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF INVESTIGATION OF THE NATURAL ELECTRICAL FIELD AT SEA
V. I. Lopatnikov 6 Jun. 1974 11 p refs Transl. into ENGLISH from Vop. Fiz. Morya (Kiev), v. 37, 1966 p 154-162
(JPRS-62181) Avail: NTIS HC $4.00

Observations of the electrical field in the sea from a stationary installation near the shore line of the Black Sea are reported. Author

N74-29706# Technische Hogeschool, Delft (Netherlands).
COMPUTATION OF SET-UP, LONGSHORE CURRENTS, RUN-UP AND OVERTOPPING DUE TO WIND-GENERATED WAVES Ph.D. Thesis
Jurjen Anno Battjes 5 Jun. 1974 251 p refs
Avail: NTIS HC $15.75

A phenomenological, hydrodynamic, and probabillistic description of water waves is presented in preface to a demonstration of the equations necessary for the computation of set-up, longshore currents, run-up, and overtopping of waves along beaches. The characteristic features of waves incident on a plane slope are shown to be functions of the wave steepness

and the slope angle. The theory of sinusoidal progressive waves, and the stochastic aspects of wind generated waves are reviewed, and equations are given for the effects of waves on a mean flow. The effects of the irregularity of waves on the radiation stresses are considered, both inside and outside the surf zone. The results of these calculations are applied to the computation of the set-up and longshore currents induced by irregular waves. The run-up and overtopping of irregular waves on relatively steep slopes is also considered, and a summary of the results follows. Author

N74-29707# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EXCITATION MECHANISM FOR TROPICAL EMISSIONS OF ATOMIC OXYGEN M.S. Thesis
J. A. Bittencourt Jan. 1972 186 p refs
(INPE-226-LAFE) Avail: NTIS HC $12.50 CSCL 04A

Electromagnetic radiations emitted by atmospheric atomic oxygen in the tropical regions and possible excitation mechanisms producing the electronic transitions are examined. Theoretical calculations of the column emission rate for the 7774 A emission produced by radiative recombination and ion-ion recombination are compared with the intensities observed, with a grille spectrometer. Calculations of the red line intensities at 6300 A by dissociative recombination are also presented together with observed intensities. Electron density profiles were obtained from ionograms taken simultaneously with the optical observations, and temperature and density profiles were calculated using static models of the thermosphere and exosphere. Author

N74-29708# La Plata Univ. (Argentina).
ANALYSIS OF TIDAL RECORDS. ABSOLUTE FILTERING METHOD
Jose Mateo 1974 118 p
Avail: NTIS HC $9.00

A new method for the analysis of tidal waves was developed. Owing to the modern technology facilities, continuous and automatic tidal records are available all the time. The filtering method proposed permits eliminating tidal components one by one, in an absolute form; thereof the name of absolute filtering. From the complete theory developed and the numerical example of its application, three important facts can be drawn out: (1) short-period tidal records can be used; (2) the tidal record can have discontinuities, and (3) a linear drift is authomatically eliminated throughout computations. To apply the method a theoretical tidal wave specially computed for La Plata latitude was developed. Author

N74-29709# Instituto Geografico y Catastral, Madrid (Spain).
SECULAR VARIATION OF THE Z VERTICAL COMPONENT COMPARED WITH THEORETICAL MODELS [VARIACION SECULAR DE LA COMPONENTE VERTICAL Z COMPARACION CON MODELOS TEORICOS]
Fernando AranazydelRio 1974 19 p refs In SPANISH; ENGLISH summary
Avail: NTIS HC $4.00

An analysis was made, by Spain and Portugal magnetic observatories, of the secular values of the vertical intensity of geomagnetic fields for the interval 1,965.5 to 1,968.5. The results are compared with the calculated values obtained from the application of the theoretical models pogo/69 and I.G.R.F. and 1,965.0. Some of the anomalies found during the experiment are pointed out. Special attention was given to the existing anomalies corresponding to the island observatories. Author

N74-29710# Weapons Research Establishment, Salisbury (Australia).
THE FEASIBILITY OF THE FALLING SPHERE AS A SOUNDING TECHNIQUE FOR THE LOWER ATMOSPHERE
S. G. Johnson Jun. 1974 31 p refs
(WRE-TN-1211(WR/D)) Avail: NTiS HC $4.75

The use of a passive falling sphere for sounding the lowest 20 km of the atmosphere was studied. Results of trajectory simulations through this region indicate that spheres can be used for determining atmospheric density, temperature, pressure, and winds. Development of a humidity sensitive device capable of being attached to the skin of the sphere shows promise for determining humidity profiles. Technical problems involved in developing the overall sounding technique are identified and reviewed. Author

N74-29711*# Oregon State Univ., Corvallis.
SECOND-YEAR PROJECTS AND ACTIVITIES OF THE ENVIRONMENTAL REMOTE SENSING APPLICATIONS LABORATORY (ERSAL) Annual Progress Report, 1 Apr. 1973 - 31 Mar. 1974
David A. Mouat and Barry J. Schrumpf 31 Mar. 1974 39 p refs
(Grant NGL-38-002-053)
(NASA-CR-139380) Avail: NTIS HC $5.00 CSCL 05B

The activities and projects of ERSAL are reported. Author

N74-29712*# Alabama A & M Univ., Normal.
INVESTIGATION OF WATER QUALITY PARAMETERS AT SELECTED POINTS ON THE TENNESSEE RIVER Final Report, 1 Jun. 1972 - 1 Sep. 1973
Martin C. Manger 1 Sep. 1973 43 p
(Grant NGR-01-001-018)
(NASA-CR-139365) Avail: NTIS HC $5.25 CSCL 08H

Physical, chemical, and biological water quality parameters have been investigated at the Widow's Creek steam plant. The water quality parameters and field site locations have been selected so as to be compatible with the interests and needs of the Environmental Application Office at Marshall Space Flight Center. All sampling and testing was conducted as directed in the 13th Edition of Standard Methods of Analysis for Water and Waste Water or as suggested by NASA'S Technical Officer. Data is presented in a form compatible with that presently being collected by other agencies. Author

N74-29713# National Oceanic and Atmospheric Administration, Boulder, Colo.
CATALOGUE OF DIGITAL GEOMAGNETIC VARIATION DATA AT WORLD DATA CENTER A FOR SOLAR-TERRESTRIAL PHYSICS
Environ. Data Serv. Jul. 1974 25 p refs
(UAG-35) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC $0.20

Hourly and 2.5 minute values for geomagnetic variation data recorded on magnetic tape were obtained from many sources and compiled in a tabular format. Other information of interest is also provided including a global map showing locations of observatories from which magnetic readings were taken, a list of additional magnetic indices available in computer format, cost and availability information for the catalog, and an explanation of the catalog and magnetic tape formats. Sources of data are fully referenced. A.A.D.

N74-29714*# Stanford Univ., Calif. Electronics Labs.
AN OCCULTATION SATELLITE SYSTEM FOR DETERMINING PRESSURE LEVELS IN THE ATMOSPHERE
A. R. Morrison, S. G. Vngar, and B. B. Lusignan [1974] 189 p refs
(Contracts NAS1-9962; NAS1-9963)
(NASA-CR-132436) Avail: NTIS HC $12.50 CSCL 04A

A two-satellite microwave occultation system is described that will fix, as an absolute function of altitude, the pressure-temperature profile generated by a passive infrared sounder. The 300 mb pressure level is determined to within 24 m rms, assuming the temperture errors produced by the infrared sensor are not greater than 2 K rms. Error caused by water vapor in the radio path is corrected by climatological adjustments. A ground test of the proposed system is described. A microwave signal propagating between two mountain tops was found to be subject to periods of intense fading. Computer analysis of the raypath between the transmitting and receiving stations indicates that multipath and defocusing were responsible for this fading. It is unlikely that an operational pressure-reference-level system will be subject to the deep fades observed in the ground test, because the phenomena are associated with lower altitudes than the closest approach altitude of an occultation-system raypath. Author

N74-29715*# Hawaii Univ., Honolulu.
CATALOG OF DATA SUMMARY OF AIRGLOW OBSERVA-

TIONS OBTAINED AT HALEAKALA, HAWAII Final Report
Walter R. Steiger and LeRoi L. Smith (Battelle Memorial Inst., Richland, Wash.) 1974 163 p refs
(Grant NGR-12-001-001)
(NASA-CR-139376) Avail: NTIS HC $11.25 CSCL 04A

The airglow studies were initiated in July 1961 in response to the discovery of unusual phenomena in the tropical airglow as observed from Algeria. Hawaii, being the southern-most area in the United States and within the tropics, and possessing high mountains with frequent clear skies well isolated from the contaminating light and dust of civilization, appeared to be an ideal location for establishing a tropical airglow station. The University of Hawaii was already developing the Mees Solar Laboratory on Haleakala on the island of Maui, so that the addition of a night sky observatory was a natural development. The collection of data covers a span of about seven and one-half years, including the minimum of the solar cycle in 1963 and just getting into the next maximum in 1968-69. It was unfortunate that financial limitations did not permit the continuation of the observations through one complete solar cycle.
Author

N74-29716*# Hawaii Univ., Honolulu.
ATLAS OF ZENITH AIRGLOW PLOTS OBTAINED AT HALEAKALA, HAWAII. VOLUME 1: JULY 1961 TO DECEMBER 1964 Final Report
Walter R. Steiger and LeRoi L. Smith (Battelle Memorial Inst., Richland, Wash.) 1974 200 p
(Grant NGR-12-001-001)
(NASA-CR-139377) Avail: NTIS HC $13.00 CSCL 04A

This Atlas presents zenith airglow intensities as a function of time as observed from Haleakala, Hawaii.
Author

N74-29717*# Hawaii Univ., Honolulu.
ATLAS OF ZENITH AIRGLOW PLOTS OBTAINED AT HALEAKALA, HAWAII. VOLUME 2: JANUARY 1965 TO JANUARY 1969 Final Report
Walter R. Steiger and LeRoi L. Smith 1974 197 p
(Grant NGR-12-001-001)
(NASA-CR-139378) Avail: NTIS HC $13.00 CSCL 04A

For abstract, see N74-29716.
Author

N74-29718# Danish Meteorological Inst., Copenhagen.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS 1970
1974 56 p
(ISBN-87-7478-089-1) Avail: NTIS HC $6.00

Recording of the three magnetic elements H, D, and Z were conducted at Thule, Greenland. Three sets of photographic variometers were used to obtain the data. The variometers are identified as: (1) a sensitive instrument, (2) an insensitive instrument, and (3) a quick run magnetograph. All variometers are of the La Cour type without damping. The characteristics of the variometers are tabulated. Hourly values of the measurements of the magnetic field are tabulated for calendar year 1970.
Author

N74-29719# Ionospharen-Institut Breisach (West Germany).
ABSORPTIONS DATA: FREIBURG, URSI-CODE 131, JULY - SEPTEMBER 1972 [ABOSORPTIONS-DATEN: FREIBURG, URSI-CODE 131, JULI - SEPTEMBER 1977]
Sep. 1972 87 p
Avail: NTIS HC $7.50

The directly observed values for the echo field strength are presented in db. Hourly values are given which reflect the diurnal variations of field strength for the digisonde range of 1.0 to 16.0 MHz.
F.O.S.

N74-29720# Danish Meteorological Inst., Charlottenlund.
GODHAVN GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS 1968
1973 56 p
(ISBN-87-7478-068-9) Avail: NTIS HC $6.00

Regular recording of the three magnetic elements H (horizontal intensity), D (declination), and Z (vertical intensity) were obtained by means of three sets of variometers. All variometers were of the La Cour type without damping and are identified as a sensitive standard magnetograph, an insensitive standard magnetograph, and a quick-run magnetograph. Characteristics of the magnetographs are given, including information on recording speed, oscillating period, weight, range, and scale values. Determinations of baseline values and reduction formulas are also explained. The tables contain the following monthly data for each of the elements H, D, and Z: (1) hourly mean values centered on the half hour; (2) daily means; and (3) hourly averages of all days of the month including the five international quiet days and the five disturbed days. Hourly ranges of H, D, and Z, in units of ten gammas, are given in corresponding tables.
A.A.D.

N74-29721# Danish Meteorological Inst., Charlottenlund.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS 1968
1973 56 p refs
(ISBN-87-7478-071-9) Avail: NTIS HC $6.00

For abstract, see N74-29720.

N74-29722# Danish Meteorological Inst., Copenhagen.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS 1969
1974 55 p refs
(ISBN-87-7478-088-3) Avail: NTIS HC $5.75

For abstract, see N74-29720.

N74-29723*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REMOTE PROFILING OF LAKE ICE THICKNESS USING A SHORT PULSE RADAR SYSTEM ABOARD A C-47 AIRCRAFT
Dale W. Cooper, John E. Heighway, Donald F. Shook, Russell J. Jirberg, and Roger S. Vickers (Stanford Research Inst., Menlo Park, California) 1974 4 p ref Proposed for presentation at the 1974 Earth Environ. and Resources Conf., Philadelphia, 10-12 Sep. 1974
(NASA-TM-X-71588; E-8041) Avail: NTIS HC $3.00 CSCL 08L

Design and operation of short pulse radar systems for use in ice thickness measurement are described. Two ice profiling systems were tested, an S system which used either random noise or continous wave modulation at 2.8 GHz and a less powerful C band system which operated at 6.0 GHz and did not have random noise modulation. Flight altitudes of 4,000 feet were used, but the S band system was usable at 7,000 feet allowing flights in poor weather conditions. A minimum ice thickness of four inches is required for measurement, while the thickest ice measured was 36 inches. System accuracy is plus or minus one inch.
E.J.O.

N74-29724*# Delaware Univ., Newark.
DYNAMICS OF PLANKTON POPULATIONS IN UPWELLING AREAS Final Report
Karl-Heinz Szekielda [1974] 45 p refs
(Contract NAS5-21784)
(NASA-CR-139042) Avail: NTIS HC $5.25 CSCL 08A

Recent investigations of the upwelling area along the NW Coast of Africa which include studies with satellites are discussed. The detection of patchiness in temperature and plankton distribution in the upwelling area is of special interest because they can be investigated from space synoptically with repeated coverage. The recent satellite missions provide recordings in the infrared region of the electromagnetic spectrum (EMR) as well as in the visible part. The information from those two parts of the EMR is useful for establishing the sea surface temperature and plankton distribution in upwelling areas. The temperature distribution as observed with infrared sensors and the patchiness in plankton patterns are discussed as observed with the most recent satellites, namely the Earth Resources Technology Satellite (ERTS) and NOAA-2.
Author

N74-29725*# Maryland Univ., College Park. Computer Science Center.
EDGE AND LINE DETECTION IN ERTS IMAGERY: A COMPARATIVE STUDY
R. Eberlein, G. J. Vanderbrug, A. Rosenfeld, and L. S. Davis Jun. 1974 17 p refs
(Grant NGR-21-002-351)
(NASA-CR-138963; TR-312) Avail: NTIS HC $4.00 CSCL

14E

Several local edge detection operators were applied to a set of ERTS pictures of the Monterey, Calif. area. Gradient operators performed consistently better than laplacian operators in detecting edges. It was also found that if a grayscale normalization operation, histogram flattening, was applied to the pictures first, the edge detector outputs were greatly enhanced. The use of interpolation for more accurate location of edges on a digital picture was also briefly investigated. Curve detection operators were applied to the edge detector outputs; this had the effect of enhancing the edges while suppressing noise. Author

N74-29726*# Scientific Translation Service, Santa Barbara, Calif.
A SYSTEM OF CONDITIONAL RELIEF SYMBOLS FOR LUNAR TOPOGRAPHIC MAPS
K. B. Shingareva and G. A. Burba Washington NASA Jul. 1974 28 p refs Transl. into ENGLISH of "Sistema Uslovnykh Znakov Relyefa dlya Lunnykh Topograficheskikh Planov", Acad. of Sci. USSR, Moscow, report, no. 152, 26 p
(Contract NASw-2483)
(NASA-TT-F-15676; Rept-152) Avail: NTIS HC $4.50 CSCL 08B

Principles for the construction of a system of conditional relief symbols for lunar topographic maps are discussed. The system is based on a letter-number scheme of logical connections between relief elements. The possibility of altering the graphical symbols of this system, depending on what is required of the topographic map, is illustrated. Alternatives for designing topographic maps for the Lunokhod-1 are presented. Author

N74-29727*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE FIRST EARTH RESOURCES TECHNOLOGY SATELLITE NEARLY TWO YEARS OF OPERATION
William Nordberg Jun. 1974 14 p refs Presented at the COSPAR Seminar on Space Appl. of Direct Interest to Developing Countries, Sao Paulo, Brazil
(NASA-TM-X-70715; X-900-74-217) Avail: NTIS HC $4.00 CSCL 22B

A brief status report on the performance of the ERTS-1, and an overview of the applications derived from the images are presented. The ERTS-1 spacecraft, sensor and picture processing systems have continued to perform almost flawlessly since August 1972. Registered, multispectral images of all major land masses of the earth, both polar and some oceanic regions are continuously made, covering daily an area of about 5 million square kilometers. The systematic repetition of these observations, which were made over most parts of the world at least once every season, and the high accuracy of thematic mapping that can be obtained from the images, have resulted in many applications that have immense potential benefits for developing countries. Among these applications are the detection and accurate mensuration of surface water; the identification and mensuration of forests, rangeland, crops and soils; the monitoring and mapping of water quality, wildlife habitats and of the effects of land use practices on food and water resources; the assessment of flooding and earthquake hazards; and the facilitation of mineral exploration. Author

N74-29728*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL DETAILED GEOID COMPUTATION AND MODEL ANALYSIS
James G. Marsh and Samir Vincent (Computer Sciences Corp., Silver Spring, Md.) Mar. 1974 52 p refs Submitted for publication
(NASA-TM-X-70709; X-921-74-131) Avail: NTIS HC $5.75 CSCL 08B

Comparisons and analyses were carried out through the use of detailed gravimetric geoids which we have computed by combining models with a set of 26,000 1 deg x 1 deg mean free air gravity anomalies. The accuracy of the detailed gravimetric geoid computed using the most recent Goddard earth model (GEM-6) in conjunction with the set of 1 deg x 1 deg mean free air gravity anomalies is assessed at + or - 2 meters on the continents of North America, Europe, and Australia, 2 to 5 meters in the Northeast Pacific and North Atlantic areas, and 5 to 10 meters in other areas where surface gravity data are sparse. The R.M.S. differences between this detailed geoid and the detailed geoids computed using the other satellite gravity fields in conjuction with same set of surface data range from 3 to 7 meters. Author

N74-29729*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE RELATION OF VARIATIONS IN TOTAL MAGNETIC FIELD AT HIGH LATITUDE WITH THE PARAMETERS OF THE INTERPLANETARY MAGNETIC FIELD AND WITH DP2 FLUCTUATIONS
R. A. Langel Jun. 1974 34 p refs Submitted for publication
(NASA-TM-X-70711; X-922-74-189) Avail: NTIS HC $4.75 CSCL 20J

The maximum disturbances from the positive and negative regions of delta B (Bp and Bn, respectively) are investigated with respect to their correlation with (1) the average N-S component, Bz, (2) the average angle with respect to the solar magnetospheric equatorial plane, theta (3) the variance, sigma sub i, and (4) the magnitude, Bi, of the interplanetary magnetic field. These quantities were averaged over a period, T, ranging from 20 min. to 8 hours prior to the measurement of Bp or Bn. Variations (i.e., disturbances) in total magnetic field magnitude were studied utilizing data from the Polar Orbiting Geophysical Observatory satellites (OGO 2, 4, and 6), unofficially referred to as POGO. Author

N74-29730# Coast Guard, Washington, D.C. Oceanographic Unit.
NORTH ATLANTIC OCEAN STATION CHARLIE, APRIL 1967 - APRIL 1968
Lawrence J. Hannon Apr. 1974 156 p refs
(USCG-373-61) Avail: NTIS HC $11.00

Oceanographic data from ten cruises on ocean station Charlie (52 deg. 45' N, 35 deg. 30' W) during the period April 1967 to April 1968 are presented. These data consist of observed and interpolated temperature and salinity data from 187 shallow and 7 deep casts. Temperature-depth and salinity-depth distribution plots show that the temperature distribution follows a seasonal trend, but the salinity distribution is more diverse. Temperature-salinity plots for the deep casts indicate the presence of Labrador sea water and Northeast Atlantic deep water. The thermohaline characteristics of the -20 salinity anomaly indicate water of subarctic intermediate water characteristics at ocean station Charlie. Examination of the sea surface temperature and salinity shows that subarctic intermediate water was formed in the area of ocean station Charlie from January to April 1968 but not from June to November 1967. Author

N74-29731# National Oceanic and Atmospheric Administration, Boulder, Colo.
AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE(10) FOR 1967
Joe Haskell Allen, Carl C. Abston, and Leslie D. Morris Environmental Data Service May 1974 146 p refs
(UAG-33) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N.C. 28801. Attn: Publications HC $0.75 CSCL 04A

The auroral electrojet index (AE) is discussed and the derivation of 10-station 2.5-min AE indices for 1967 is described. Tables are given of hourly average indices for each day of the year, of the stations making the main contribution to the hourly indices, and of the average monthly quiet-time level of horizontal fields at each magnetic observatory. Graphs of the index variations are included for each day of 1967. Author

N74-29732*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.
BASIC RESEARCH AND DATA ANALYSIS FOR THE NATIONAL GEODETIC SATELLITE PROGRAM AND FOR THE EARTH AND OCEAN PHYSICS APPLICATIONS PROGRAM Semiannual Status Reports, Jan. - Jun. 1974
Jul. 1974 99 p refs
(Grants NGL-36-008-093; NGR-36-008-204; OSURF Proj. 2514; OSURF Proj. 3820-A1)
(NASA-CR-139249; SASR-14; SASR-2) Avail: NTIS HC $8.00 CSCL 08E

Activities related to the National Geodetic Satellite Program

are reported and include a discussion of Ohio State University's OSU275 set of tracking station coordinates and transformation parameters, determination of network distortions, and plans for data acquisition and processing. The problems encountered in the development of the LAGEOS satellite are reported in an account of activities related to the Earth and Ocean Physics Applications Program. The LAGEOS problem involves transmission and reception of the laser pulse designed to make accurate determinations of the earth's crustal and rotational motions. Pulse motion, ephemeris, arc range measurements, and accuracy estimates are discussed in view of the problem. Personnel involved in the two programs are also listed, along with travel activities and reports published to date. A.A.D.

N74-29733*# Arizona Univ., Tucson. Office of Arid Lands Studies.
APPLICATION OF REMOTE SENSING TO STATE AND LOCAL GOVERNMENT (ARSIG) Annual Report
Kenneth E. Foster and Jack D. Johnson Apr. 1974 113 p refs Original contains color illustrations
(Grant NGL-03-002-313)
(NASA-CR-139315; AR-2; OALS-Bull-7) Avail: NTIS HC $8.75 CSCL 08B

Progress of ARSIG projects is reported and the impact of the projects upon policy decision within Arizona is discussed. E.J.O.

N74-29734# Bureau of Mines, Denver, Colo. Mining Research Center.
IMPROVED ELECTRICAL RESISTIVITY FIELD SYSTEM FOR SHALLOW EARTH MEASUREMENTS
C. Melvin Lepper and James H. Scott 1974 22 p refs
(BM-RI-7942) Avail: NTIS HC $4.25 CSCL 08M

The Bureau of Mines has developed an improved earth resistivity field system which employs a technique for obtaining null measurements. The instrument is designed to operate reliably in high-noise environments such as those found in the vicinity of operating mines. The system consists of a low frequency transmitter, a sensitive receiver, and an external battery pack, each in its own case to provide protection from the elements. The receiver and transmitter units have self-contained rechargeable batteries to supply power to the circuitry and separate built-in battery chargers that operate on standard 115 Vac power. The system is portable and simple to operate. Measurement accuracy, reliability, and dynamic range are superior to most commercially available equipment even though less time and effort is required to make null readings. Unlike some commercial systems, long integration times are not required to enhance signal-to-noise ratio in areas of high background noise. Author

N74-29735*# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
IONOSONDE UNDERLYING IONIZATION CORRECTION USING IONOSPHERIC MODELS
Daniel F. Ferriola 3 Jul. 1974 42 p refs
(Grant NGL-39-009-003; Contract N00014-67-A-0385-00-17)
(NASA-CR-139213; SR-425E; PSU-IRL-SCI-425E) Avail: NTIS HC $5.25 CSCL 04/1

Ionogram reduction has been hampered for many years by the lack of a virtual height trace at the lower frequencies of the ionogram. The missing lower trace contains information concerning the ionization in the E and F1 region, which is needed to accurately convert the virtual height and frequency profile into a real height and electron-density profile. A method to account for this underlying ionization using ionospheric models is presented and the results compared with other sounding techniques. Author

N74-29736# Environmental Prediction Research Facility (Navy), Monterey, Calif.
A VERTICALLY INTEGRATED HYDRODYNAMICAL-NUMERICAL MODEL, W. HANSEN TYPE MODEL DESCRIPTION AND OPERATING/RUNNING INSTRUCTIONS, PART 1
Jan. 1974 67 p refs
(AD-778609; ENVPREDRSCHF-tech-note-1-74; EPRF-TN-10) Avail: NTIS CSCL 08/3

The report presents an operational description of the single-layer vertically integrated Hydrodynamical-Numerical (HN) model. The model is an adaptation of one developed by Professor Walter Hansen, University of Hamburg, and tested over the course of two decades. The description includes the setting up of the model for a given area and the selection and preparation of input data. A brief background of the hydrodynamical formulas and their finite difference forms are also presented. For coastal applications, it is now possible to run the model with three open boundaries. Another new feature makes possible the inclusion of the permanent (thermohaline component) current as well as tidal and wind currents. The transport and diffusion equation is included in the new program. Thus, the program can be used for computing the distribution of pollutants. The program (see Appendix C) is written in FORTRAN and thus will run on almost any computer. (Modified author abstract) GRA

N74-29737# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET MATERIAL ON INTERNAL WAVES, OCTOBER - DECEMBER 1973
Stuart G. Hibben 31 Jan. 1974 20 p refs
(Contract F44620-72-C-0053; ARPA Order 1622)
(AD-776067; AFOSR-74-0359TR) Avail: NTIS CSCL 08C

The paper contains a preliminary bibliography of Soviet material relating to internal wave problems. (Modified author abstract) GRA

N74-29738# Coast Guard, Washington, D.C.
REPORT OF THE INTERNATIONAL ICE PATROL SERVICE IN THE NORTH ATLANTIC OCEAN: SEASON OF 1971 Oceanographic Report, 9 Mar. - 29 Jun. 1971
E. A. Delaney 30 Jan. 1974 51 p refs
(AD-778013; USCG-Bull-57; USCG-188-26) Avail: NTIS CSCL 08/10

The report is the 57th in a series of annual reports on the International Ice Patrol Service in the North Atlantic Ocean. It contains information on Ice Patrol organization, communications and operations, and on ice and environmental conditions which existed during the 1971 International Ice Patrol year. Author (GRA)

N74-29739# Florida Atlantic Univ., Boca Raton. Dept. of Geography.
URBAN PATTERN RECOGNITION AND IMAGE COLOR DISCRIMINATION WITH TV WAVEFORMS AND COMPUTERIZED MATRIX ANALYSIS AND MAPPING Final Report, 1970 - 1973
James P. Latham Mar. 1974 87 p refs
(Contract N00014-67-A-0320-0003; NR Proj. 389-151)
(AD-778043) Avail: NTIS CSCL 08/6

The report presents concepts, instrumentation techniques, methodology and experimental results of investigations which evaluated feasibility of applying black and white television and waveform signals to purpose of quantitatively recognizing, discriminating and mapping geographic patterns in imagery or in electronic signals via which such are transmitted. Colors in aerial photographs, or the environment, are discriminated and identified by combination of relative signal values when filters are used to gather the signal data. Four or less filters were required for 96 colors tested. Consequently, phenomena may be identified by color. Recognition of terrain, or land use, patterns found in an urbanized coastal environment is feasible. The technique is applicable to any pattern at any scale. Annotated bibliographic file of articles on computerized image processing published in geographic and photogrammetric journals from 1963 to 1973 is also presented. (Modified author abstract) GRA

N74-29740# Naval Research Lab., Washington, D.C.
PRELIMINARY REPORT ON THE TRANSPORT AND PRODUCTION OF ENERGETIC ELECTRONS IN AURORAS
D. J. Strickland and P. C. Kepple Apr. 1974 24 p refs
(AD-779262; NRL-MR-2779) Avail: NTIS CSCL 04/1

A method is described for solving a transport equation for energetic auroral electron fluxes. Selected results are presented for an incident electron flux sharply peaked at 750 eV and isotropic in the downward hemisphere. The results include the energy spectrum of the backscattered flux, downward and upward fluxes at various altitudes, angular distributions of fluxes, and volume production rates. Author (GRA)

N74-29741# Washington Univ., Seattle. Div. of Marine Resonances.
ARCTIC ICE DYNAMICS JOINT EXPERIMENT. AIDJEX BULLETIN
Jan. 1974 164 p refs
(Contract NSF C-625)
(PB-230378/2; AIDJEX-Bull-23) Avail: NTIS HC $5.00 CSCL 04B

The AIDJEX numerical modeling group papers deal with such subjects as the energetics of pressure ridging, the theory of sea-ice movement, the roughness parameter of sea ice, the mechanics of rafting, and similarity constants in the planetary boundary layer. An analysis of oceanographic data from the 1972 AIDJEX pilot study is included, as well as a scheme for classifying the regional and seasonal variations of ridges. Finally there is a description of the AIDJEX lead experiment, a program of atmospheric and oceanic observations at a newly created lead which will be conducted offshore from Barrow, Alaska.
GRA

N74-29742# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
A 1 DEGREE X 1 DEGREE MEAN FREE-AIR GRAVITY ANOMALIES Reference Publication
Dec. 1973 134 p refs
(AD-779255; DMAAC-Ref-Pub-73-0002) Avail: NTIS CSCL 08/5

The publication presents a current set of 1 degree x 1 degree mean free-air gravity anomalies, their respective estimated standard errors and the method used to compute/predict the magnitude of the anomalies.
GRA

N74-29743# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
COLLECTED REPRINTS-1972, VOLUME 2
Jul. 1973 540 p refs
(AD-779338) Avail: NTIS MF $1.45; SOD HC $4.05 as C52.23.972/2 CSCL 08/3

Volume II contains a collection of reprints of research completed by NOAA's oceanographic and meteorological laboratory for 1972. Topics discussed fall under the headings of marine geophysics and geology, and air water interactions.
GRA

N74-29744# Scripps Institution of Oceanography, La Jolla, Calif.
OCEAN STUDIES Final Report, 1963 - 1973
Apr. 1974 53 p refs
(Contract N00014-69-A-0200-6006)
(AD-779296; SIO-Ref-74-14) Avail: NTIS CSCL 08/1

The report includes a summary and bibliography of work done under contract in oceanography, from 1963 to 1973 by the Scripps Institution located at La Jolla, CA.
GRA

N74-29745# Utah State Univ., Logan. Logan Space Science Lab.
ROCKET INSTRUMENTATION FOR AURORAL ZONE ABSORPTION MEASUREMENTS: BLACK BRANT 17.110-1 AND BLACK BRANT 17.110-2
Carl Howlett, Gary K. LeBaron, and Ronald J. Bell Jan. 1974 145 p refs
(Contract F19628-72-C-0255; AF Proj. 7663)
(AD-779675; AFCRL-TR-74-0057; SR-2) Avail: NTIS CSCL 04/1

Two Black Brant rockets were flown from the Churchill Research Range, Manitoba, Canada, to study an auroral zone absorption (AZA) event. The first payload (Black Brant 17.110-2) was launched 24 September 1972 into an AZA event producing 1.5 db of absorption on a 30-MHz polar riometer. The second payload was launched the next day into quiet conditions. Each payload contained instrumentation to measure ionizing sources, the resulting ionization, and minor constituents. Both payloads were developed and instrumented at Space Science Laboratory at Utah State University under contract with Air Force Cambridge Research Laboratories.
Author (GRA)

N74-29746# Naval Research Lab., Washington, D.C.
THE NIGHTTIME LOWER IONOSPHERE
D. F. Strobel, T. R. Young, R. R. Meier, T. P. Coffey, and A. W. Ali Apr. 1974 35 p refs
(RR0330242)
(AD-778997; NRL-MR-2778) Avail: NTIS CSCL 04/1

Detailed numerical calculations for the nighttime lower ionosphere are performed to evaluate the quantitative importance of nighttime radiation fields. Models for the intensities of night sky HI 1216, HI 1026, HeI 584, and HeII 304A radiation are presented and the production rates of ion species are calculated. The intensity of the Lyman- and Lyman-radiation fields from terrestrial and extraterrestrial sources is sufficient to maintain the nighttime lower ionosphere at observed electron density levels. Analysis of ion composition data indicates that on winter anomalous days of D-region ionospheric absorption the E-region is substantially depleted of NO molecules.
Author (GRA)

N74-29747# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MICROPULSATION OBSERVATIONS OF THE AURORAL OVAL BOUNDARY Environmental Research Papers
Elwood Maple 28 Jan. 1974 36 p refs
(AF Proj. 8601)
(AD-779761; AFCRL-TR-74-0054; AFCRL-ERP-463) Avail: NTIS CSCL 04/1

At the sub-auroral-zone latitude (+54 degrees geomagnetic) of the AFCRL field station, geomagnetic micropulsations associated with the auroral oval are observed only during large nighttime disturbances. Hourly amplitudes of the horizontal component of the micropulsations in octave period bands in the 0.5 to 1024 sec period range are used as measures of the activity. Near local midnight, consistently small values are observed with local K indices < or = 5. The southern boundary of the expanding oval approaches the station as the K index increases to 7, and large amplitudes appear. The A-O (auroral oval) micropulsations are attributed to hydromagnetic waves that propagate in the guided mode from the plasma sheet in the magnetospheric tail. The diurnal variations of the A-O amplitudes, which depend upon the micropulsation periods, are attributed to variations of the source strength in the plasma sheet.
Author (GRA)

N74-29748# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
PHOTOCHEMICAL MODELS OF STRATOSPHERIC OZONE: A REVIEW Air Force Surveys in Geophysics
Samuel Y. K. Yee 12 Feb. 1974 23 p refs
(AF Proj. 8604)
(AD-779685; AFCRL-AFSIG-283; AFCRL-TR-74-0098) Avail: NTIS CSCL 04/1

Existing photochemical theories of stratospheric ozone are surveyed. Recent modifications to Chapman's 1930 classical model have been focused on the search for additional sinks for stratospheric ozone, while relatively little attention has been given to the uncertainties in its production rate. A critical discussion is presented on the uncertainties involved in the photo-dissociation rate of molecular oxygen which is the determining factor in the ozone production rate.
Author (GRA)

N74-29749# Stanford Research Inst., Menlo Park, Calif.
DNA PROJECT 609 RADAR: AURORAL BACKSCATTER MEASUREMENTS Final Report, 15 Jun. 1972 - 31 Jan. 1974
R. I. Presnell Apr. 1974 155 p refs
(Contract DNA001-72-C-0179; SRI Proj. 2001)
(AD-779063; DNA-3307F) Avail: NTIS CSCL 04/1

In 1972 a 398-MHz phased array antenna system was installed at Homer, Alaska and integrated with the DNA 609 radar system. This report describes the results of the first year of the phased array radar operation in the auroral zone. During the year, the radar site was manned for approximately seven weeks. Over 70 hours of clutter-map digital tape recordings were taken using the phased array radar. All of the data has been surveyed and portions of it analyzed in great detail. During the past year the mathematical reflection mechanism theory was developed extensively. The fluid theory of a two-stream plasma instability was extended to allow for different electron and ion temperatures. Closed-form solutions were developed that show the analytic dependence of all physical quantities of interest and the general physical behavior of instability. In addition to

the research studies a number of equipment modifications and additions were made to improve the reliability of the phased-array antenna system and the data-handling capability of the digital data processing system. (Modified author abstract) GRA

N74-29750# Aerospace Corp., El Segundo, Calif.
THE AEROSPACE CORPORATION SPACE SCIENCE PROGRAM REPORT TO COSPAR CY 1973 Interim Report
George A. Paulikas 25 Apr. 1974 27 p refs
(Contract F04701-73-C-0074)
(AD-779681; TR-0074(4260-01)-3; SAMSO-TR-74-105) Avail: NTIS CSCL 04/1

The results obtained during 1973 by the space research program of The Aerospace Corporation are presented. Research projects dealing with the aurora, the magnetosphere, the earth's upper atmosphere as well as the solar corona are described.
Author (GRA)

N74-29751# National Oceanic and Atmospheric Administration, Miami, Fla.
COLLECTED REPRINTS, 1972, VOLUME 1
Jul. 1973 487 p refs
(AD-779337) Avail: NTIS MF $1.45; SOD HC $4.45 as C52.23:972/2 CSCL 08/3

Volume I contains a collection of reprints of research completed by NOAA's Oceanographic and meteorological laboratory for 1972. Topics discussed fall under the headings of physical oceanography and marine meteorology. GRA

N74-29752# Arkansas Univ., Fayetteville. Water Resources Research Center.
BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT Project Completion Report
W. P. Waite, K. R. Cook, and B. B. Bryan Nov. 1973 177 p refs
(Contract DI-14-31-0001-3557)
(PB-231558/8; OWRR-B-020-ARK(1); Publ-18; W74-07052; RR-23) Avail: NTIS HC $4.75 CSCL 08H

A theoretical and experimental study of the microwave reflectivity of soils with varying moisture content was conducted. A system was developed to measure reflectivity over a continuous frequency range of 4 to 26.5 GHz, at incidence angles from 10 degrees to 70 degrees, and with both horizontal and vertical polarization. The measurements were found to be extremely accurate for smooth homogeneous surfaces, however, the effects of surface roughness were more severe than predicted due to the discontinuous nature of naturally occurring rough surfaces. (Modified author abstract) GRA

N74-29753# Earth Satellite Corp., Washington, D.C.
AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMUM WEATHER
Robin I. Welch, Allan D. Marmelstein, and Paul M. Maughan Sep. 1973 63 p refs
(Contract EPA-68-01-0191)
(PB-231817/8; EPA-R2-73-243) Avail: NTIS MF $1.45; SOD HC $1.40 as EP1.23/2:73-243 CSCL 13B

Multiband aerial photography was acquired during specified conditions of cloud cover and reduced visibility considered to be representative of a nearly infinite range of suboptimum weather conditions. Results indicated that only one film tested, a high sensitivity color positive film, provided consistently interpretable results. Rapid access techniques were also evaluated leading to recommendations for a tactical system providing a capability for both realtime and near realtime system update during suboptimum serial photographic conditions. GRA

N74-29754# Pittsburgh Univ., Pa. Space Research Coordination Center.
THE 6300A INTENSITY VARIATIONS PRODUCED BY THE ARECIBO IONOSPHERIC MODIFICATION EXPRIMENTS
Dwight P. Sipler, E. Enemark, and Manfred A. Biondi May 1974 26 p refs
(Contract DAHC04-73-C-0037; Grant NSF GA-37744; ARPA Order 826; AROD Proj. P-11427-P)
(AD-779548; SRRC-203; APP-46) Avail: NTIS CSCL 04/1

Nightglow 6300A intensity suppression and enhancement transients have been observed in conjunction with heating of the F region ionospheric electrons in Arecibo Ionospheric Modification Experiments (I.M.E.). Ohmic heating of the electrons during X-mode propagation of the heating wave results in an approximately 1.3% suppression of intensity, in semi-quantitative agreement with the suppression predicted. The 6300A intensity enhancements associated with O-mode propagation of the heating wave are far too large to be produced by ohmic heating, suggesting electron acceleration by strong plasma waves generated by the heating rf wave. The O(singlet D) lifetimes determined from the time constants of the 6300A intensity enhancement transients yield an F region quenching coefficient in good agreement with the Platteville I.M.E. and with laboratory results. (Modified author abstract) GRA

N74-29755# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FEATURES OF LATERAL SCANNING FROM ARTIFICIAL EARTH SATELLITES (CHAPTER 4)
N. I. Burenin 15 Apr. 1974 23 p refs Transl. into ENGLISH from the book "Radiolokatsionnye Stantsii s Sintezirov Annoi Antennoi" USSR, 1972 p 145-159
(AD-779280; FTD-MT-24-781-74) Avail: NTIS CSCL 08/6

The characteristic conditions under which lateral scanning is performed are listed. The influence of these conditions on construction and operation of a lateral scanning radar is analyzed. E.J.O.

N74-29756# Woods Hole Oceanographic Institution, Mass.
GRAVITY BASE STATION DESCRIPTIONS
Carl Bowin and Leon Gove Feb. 1974 348 p
(Contract N00014-66-C-0241; NR Proj. 083-004)
(AD-775965; WHOI-74-11) Avail: NTIS CSCL 08/5

Descriptions of gravity base stations occupied by the Woods Hole Oceanographic Institution during the years 1962 through September 1973 are presented. The measurements were made with LaCoste and Romberg Geodetic Gravity Meter No. G-18. The gravity values, in the Potsdam System, given for these stations are for the most part based on a value of 980326.04 at station 317 in Woods Hole, which is based on a value of 980118.00 for the National COMMERCE gravity base in Washington, D.C. For those stations for which IGSN 71 values are available, the differences between the IGSN 71 values and the G-18 values have a mean of -13.34 mgal, a standard deviation of 0.64 mgal, a median of 13.53 mgal, and an RMS of 13.36 mgal. The internationally adopted difference between the IGSN 71 System and the Potsdam System is -14.00 mgal. Author (GRA)

N74-29757# Army Foreign Science and Technology Center, Charlottesville, Va.
RESULTS OF TESTS OF A TsNIIGAiK (CENTRAL SCIENTIFIC RESEARCH INSTITUTE OF GEODESY, AERIAL SURVEYING AND CARTOGRAPHY) AIRBORNE RADIO RANGE FINDER IN A MOUNTAINOUS REGION
I. L. Gill and K. N. Gertsenova 9 Nov. 1973 7 p Transl. into ENGLISH from Geodeziya i Kartografiya (USSR), no. 6, 1972 p 40-43
(AD-779602; FSTC-HT-23-778-73) Avail: NTIS CSCL 08/5

In tests of an airborne radio range finder, measurement of the base by internal traverse of the direction line, radio geodetic determination of coordinates and laying out of skeleton routes along a series of points of the survey base were carried out. In distinction from use over flat terrain, flight heights were determined from barometric data for reduction of distances to the surface of an ellipsoid. Base measurements at 3000 and 4000 m were unsatisfactory, due to the presence of obstacles to passage of radio waves; however, recordings at 5000 m were wavy, but readable. A method of determination of the root mean error is presented and the resulting errors are of the same order of magnitude as in aerial surveys at the same scale in flat regions.
GRA

N74-29758# Commonwealth Scientific and Industrial Research Organization, Mordialoc (Australia). Div. of Atmospheric Physics.
SOLAR RADIATION STATISTICS FOR AUSTRALIA
G. W. Paltridge 1974 25 p refs
(PB-230774/2; ISBM-0-643-00082-8; Tech-Paper-23) Avail:

NTIS HC $4.25 CSCL 04A

Contour maps of seasonal average solar radiation parameters are computed from detailed cloud cover information. The parameters include direct and global fluxes on horizontal, inclined and 'suntracking' surfaces. Contour maps of cloud cover probabilities are included. Author (GRA)

N74-29759# Utah State Univ., Logan. Center for Research in Aeronomy.

MEASUREMENT OF ATOMIC OXYGEN IN THE MESOSPHERE Final Report, 1 Dec. 1970 - 31 Dec. 1973

Laurence R. Thorne, Lawrence R. Megill, and William M. Moore 31 Dec. 1973 22 p refs

(Grant DA-ARO(D)-31-124-71-G107)

(AD-779492; AROD-9738-1-EN) Avail: NTIS CSCL 04/1

The oxidation rates of silver films by atomic oxygen and ozone have been examined and compared. The conductivities of the silver were measured as a function of the oxidation state. Several factors make the results of these measurements appear complex, and calibrations are necessary for atmospheric use. The apparent autocatalytic nature of the reaction and resistance coasting are examined in terms of a plausible mechanism. The increase in mass is amenable to direct correlation and confirms an initial rate law which is first order in the oxidation component. It was concluded that silver films are good detectors for atomic oxygen, and that ozone would not interfere with this measurement above an altitude of 38 km. Author (GRA)

N74-29760# Naval Underwater Systems Center, New London, Conn.

EFFECTIVE EARTH CONDUCTIVITY MEASUREMENTS AT THE WISCONSIN TEST FACILITY DURING THE SUMMER OF 1973

Peter R. Bannister and Grayson R. Canfield 6 May 1974 23 p refs

(AD-779288; NUSC-TR-4695) Avail: NTIS CSCL 08/7

From 15 July through 4 August 1973, the Naval Underwater Systems Center measured the effective earth conductivity beneath the four halves of the Wisconsin Test Facility (WTF) antennas. The H/I induction method of conductivity measurements was used with each half-antenna alternately employed as the source, and some measurements were also obtained with the full-length N-S and E-W antennas as sources. The principal results are that (1) the minimum distance for determining the effective earth conductivity by the H/I method is 7 effective earth skin depths, and (2) the method of measuring each half-antenna in order to predict the effective conductivity of the whole antenna is correct within a factor of 1.22. Author (GRA)

N74-29761# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

COMPUTATIONAL METHODS FOR DETERMINING 1 DEGREE X 1 DEGREE MEAN GRAVITY ANOMALIES AND THEIR ACCURACIES Reference Publication

Nov. 1973 36 p refs

(AD-779248; DMAAC-Ref-Pub-73-0001) Avail: NTIS CSCL 08/5

The publication contains the explanations of the methods used in computing the 1 degree x 1 degree mean free-air gravity anomaly values and their accuracies. The information contained in this report is in two parts. Part I identifies each computational method, gives a written definition, and furnishes the equations with a sample computation. When and how the method should be used and any strengths and shortcomings of the method are addressed. Part II identifies the method used to arrive at an accuracy value for each computational method, gives a written definition with associated equations, and provides a sample computation. Shortcomings of the methods are stated. (Modified author abstract) GRA

N74-29762# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Section.

GRAVITY ANOMALY EXPANSION IN ELLIPSOIDAL LAME FUNCTIONS

L. A. Savrov Feb. 1974 20 p refs Transl. into English from Tr. Gos. Astron. Inst. (Moscow), v. 43, no. 2, 1972 p 18-29

(AD-779157; DMAAC-TC-2008) Avail: NTIS CSCL 08/5

The author examines the possibility of representing the earth's gravitational field as an infinite series of polynomials from ellipsoidal functions. He obtains a method for finding the unknown expansion coefficients from the observed gravity values. GRA

N74-29763# Brandeis Univ., Waltham, Mass. Dept. of Physics.

QUANTUM FIELDS AND GRAVITATION Final Report, 1 Oct. 1969 - 31 Dec. 1973

Stanley Deser 1974 11 p refs

(Grant AF-AFOSR-1864-70; AF Proj. 9767)

(AD-779789; AFOSR-74-0816TR) Avail: NTIS CSCL 20/10

The author has investigated a number of problems on the interface between gravitation and quantum theory. These include: (1) study of restrictions on coupling of matter sources to gravitation, alternatives to Einstein theory and experimental constraints on the theory; (2) stability of solutions of Einstein equations near vacuum, and in closed spaces; and, (3) the finite range problem in gravitation and the discontinuities between finite and infinite range predictions. (Modified author abstract) GRA

N74-29764# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Section

ON THE QUESTION OF DEFORMATION OF THE GEOID

E. M. Shatalova Apr. 1974 13 p refs Transl. into ENGLISH from Geod., Kartografiya i Aerofotosemka (USSR), no. 15, 1972 p 109-113

(AD-778794; DMAAC-TC-2010) Avail: NTIS CSCL 08/5

The paper investigates the problem of the geoid deformation caused by the compensation of topographic masses according to the Airy-Heiskanen procedure. This procedure was selected as more acceptable in the physical sense and repeatedly verified by seismic investigations. The presence of regional compensation is presupposed. Author (GRA)

N74-29765# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Section.

ON THE QUANTITATIVE INTERPRETATION OF ANOMALIES OF TRANSFORMED FUNCTIONS

I. A. Zhuralev Mar. 1974 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved. Geol. Razved. (USSR), no. 5, 1973 p 127-131

(AD-778795; DMAAC-TC-2013) Avail: NTIS CSCL 08/5

An approximate method is worked out for solving the inverse problem of gravity surveying from values of gravity variation. It is based on the method of extending the solution by parameter. To obtain stability of the solution, the regularizing algorithm of A. N. Tikhonov is used. The anomalous objects are approximated by a set of elementary prisms to carry out the method on the Minsk-22 electronic computer, allowing of about 10-15% (estimate from trying the method on a model) in the presence of a regional background close to linear and a level of random errors in the initial gravity values on the order of 0.2 mgal. The proposed method could be applied without significant change to the interpretation of any other transformed functions. Author (GRA)

N74-29766# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Section.

RESULTS OF CORRELATION OF DEEP SEISMIC SOUNDING AND GRAVIMETRY DATA

Yu. G. Jurov and Z. N. Efimkina Apr. 1974 25 p refs Transl. into ENGLISH from the book "Izostaziya Isostasky" Moscow, 1973 p 53-67

(AD-778796; DMAAC-TC-2017) Avail: NTIS CSCL 08/11

On the basis of kinematically coordinated deep seismic sounding models, the gravity field was analyzed by using the relationship between density and velocity. It was shown that the total field is determined mainly by the structure of the sedimentary layer and the depth to the M surface. The effect of density variations in the consolidated crust is less important. No noticeable contribution by the mantle's heterogeneities was disclosed. In most cases, density variations in the earth's crust produce gravitational effects of an isostatic nature. An approximate method was proposed and tested for the computation of the depth of the M surface by Bouguer anomalies. (Modified author abstract) GRA

N74-29767# Blood Research Inst., Boston, Mass. Red Cell Metabolism Lab.
COMPUTED DIPOLE RESISTIVITY EFFECTS FOR AN EARTH MODEL WITH VERTICAL AND LATERAL CONTRASTS IN RESISTIVITY
Robert B. Furgerson and George V. Keller 12 Mar. 1974 196 p refs
(Contract N00014-71-A-0430-0003; NR Proj. 081-275)
(AD-776651) Avail: NTIS CSCL 08/7

The dipole sounding method has been used by several investigators in attempts to determine the maximum resistivity in the earth's crust. The results of such surveys have shown that apparent values of measured resistivity pass through a maximum at dipole spacings of several tens to a hundred kilometers. In interpretation, this behavior is interpreted as indicating the leakage of current through the resistant part of the crust into more conductive regions in the mantle. Computer model studies of the effects of lateral changes in resistivity, as directed in this report, indicate that the maximum on a dipole sounding curve can be caused by a wide variety of lateral changes in resistivity, as well as by leakage of current into the mantle. When this happens, the value for the resistivity-thickness product representing the resistant part of the crust can be underestimated by a large amount. (Modified author abstract) GRA

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-29768*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SOFTWARE AND MODIFICATIONS FOR AUTOMATED MICROWAVE SPECTRAL MEASUREMENTS ON THE HEWLETT PACKARD 8460 SPECTROMETER
William F. White 1 Jul. 1974 99 p refs
(NASA-TM-X-71993) Avail: NTIS HC $4.00 CSCL 14B

A Hewlett-Packard 8460A spectrometer was adapted for automatic spectral searches and measurements under computer control. Software consists of a BASIC language control program and assembly language equipment drivers. Complete software listings are given including cross reference tables. Each equipment driver program is discussed, and wiring diagrams are given for the additions required for computer control. Author

N74-29769*# Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.
PRELIMINARY FLIGHT PROTOTYPE SILVER ION MONITORING SYSTEM Final Report
J. Brady Jun. 1974 214 p
(Contract NAS9-13387)
(NASA-CR-134361; FR-2656-101) Avail: NTIS HC $13.75 CSCL 14B

The design, fabrication, and testing of a preliminary flight prototype silver ion monitoring system based on potentiometric principles and utilizing a solid-state silver sulfide electrode paired with a pressurized double-junction reference electrode housing a replaceable electrolyte reservoir is described. The design provides automatic electronic calibration utilizing saturated silver bromide solution as a silver ion standard. The problem of loss of silver ion from recirculating fluid, its cause, and corrective procedures are reported. The instability of the silver sulfide electrode is discussed as well as difficulties met in implementing the autocalibration procedure. Author

N74-29770# Technischen Universitaet, Hanover (West Germany).
A HIGH RESOLUTION MICHELSON INTERFEROMETER FOR SPECTRAL LASER STUDIES Ph.D. Thesis [EIN HOCHAUFLOESENDES MICHELSON-INTERFEROMETER FUER SPEKTRALE UNTERSUCHUNGEN AN LASERN]
Bernd Wellegehausen 1972 129 p refs In GERMAN
Avail: NTIS

A Michelson interferometer with an optical delay line is reported that has a theoretical resolution power of about 10 to the 12th power up to 10 to the 13th power. The instrument is capable of measureing line widths, noise frequency modulation spectra and other characteristics of lasers. Transl. by G.G.

N74-29771# Australian Post Office Research Labs., Melbourne. Research Labs.
AN INSTRUMENTATION SYSTEM FOR 150 Mbit/s DIGITAL TRANSMISSION SYSTEMS
A. Y. C. Quan Dec. 1973 32 p refs
(Rept-6819) Avail: NTIS HC $4.75

A breadboard model of an instrumentation system suitable for testing bit error rates in high speed digital transmission systems is described. Practical problems encountered with its construction are encompassed and recommendations for extending the features of the system are made. Author

N74-29772*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELECTRICAL CONDUCTIVITY CELL AND METHOD FOR FABRICATING THE SAME Patent Application
William P. Gilbreath, Michael J. Adamson, and Alex Fassbender, inventors (to NASA) (Foothill Coll.) Issued 16 Jul. 1974 12 p
(NASA-Case-ARC-10810-1; US-Patent-Appl-SN-489009) Avail: NTIS HC $4.00 CSCL 14B

A flask having a threaded neck and a cap adapted for threaded engagement on the neck is described. A laminated disk between the cap and the neck forms a gas tight seal, and the cap has a central opening that exposes a medial region of the disk. Piercing the disk through the opening are two electrodes, the inner ends of which contact the sample within the flask and the outer ends of which afford connection of test equipment. Cylindric glass tubes are fitted over the external portion of the electrodes to provide physical support; silicone rubber or the like serves to retain the glass cylinders in place and form a gas tight seal between the cylinders and the electrodes. Shrinkable tubing is shrunk over the glass tubes to afford further mechanical support and sealing. NASA

N74-29773*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRIELECTRODE CAPACITIVE PRESSURE TRANSDUCER Patent Application
Grant W. Coon, inventor (to NASA) Issued 31 Jul. 1974 24 p
(NASA-Case-ARC-10711-1; US-Patent-Appl-SN-493363) Avail: NTIS HC $4.25 CSCL 14B

A capacitive transducer and circuit which consists of two capacitive electrodes and a shield electrode, and which is suited for making measurements in a high temperature environment is described. A rise in temperature causes resistance of the insulation between the capacitive electrode to decrease, and the resistive current to attempt to interfere with the capacitive current between the capacitive electrodes. The shield electrode and the circuit coupled to it reduces the resistive current in the transducer. A bridge-type circuit coupled to the transducer ignores the resistive current and measures only the capacitive current flowing between the capacitive electrodes. NASA

N74-29774*# Sperry Rand Corp., Phoenix, Ariz. Flight Systems.
DESIGN STUDY FOR A MAGNETICALLY SUPPORTED REACTION WHEEL Final Report
G. Stocking, J. Dendy, and A. Sabnis Jul. 1974 88 p Prepared for JPL
(Contracts NAS7-100; JPL-953884)
(NASA-CR-139282; Pub-71-0489-00-00) Avail: NTIS HC $7.50 CSCL 17G

Results are described of a study program in which the characteristics of a magnetically supported reaction wheel are defined. Tradeoff analyses are presented for the principal components, which are then combined in several reaction wheel design concepts. A preliminary layout of the preferred configuration is presented along with calculated design and performance parameters. Recommendations are made for a prototype development program. Author

N74-29775*# National Bureau of Standards, Washington, D.C.
HIGH RELIABILITY SHEATHED, BERYLLIA INSULATED, TUNGSTEN-RHENIUM ALLOY THERMOCOUPLE ASSEMBLIES; THEIR FABRICATION AND EMF STABILITY
G. W. Burns, W. S. Hurst, and M. G. Scroger Jun. 1974 38 p refs
(NASA Order C-61545-B)
(NASA-CR-134549; NBSIR-74-447) Avail: NTIS HC $5.00 CSCL 14B

Tantalum sheathed, BeO insulated, W-3% Re/W-25% Re thermocouple assemblies were fabricated and their emf drift determined during 2059 hours of exposure at 2073 K in a gaseous helium environment. The sheathed thermocouple assemblies were constructed from aged thermoelements, specially heat-treated BeO insulators, and specially cleaned and etched tantalum sheaths. Their thermal emf drifts ranged from the equivalent of only -0.3 to -0.8 K drift per 1000 hours of exposure at 2073 K. No evidence of any gross chemical attack or degradation of the component materials was found. The emf drift and material behavior of some unsheathed, BeO insulated, W-3% Re/W-25% Re thermcouples at 2250 and 2400 K were also determined. Unsheathed thermocouples tested in an argon environment at 2250 K for 1100 hours and at 2400 K for 307 hours exhibited changes in thermal emf that typically ranged from the equivalent of a few degrees K to as much as +11 K. Post-test examinations of these thermocouples revealed some undesirable material degradation and interaction which included erosion of the BeO insulators and contamination of the thermoelements by tantalum from the tantalum blackbody enclosure in which the thermocouples were contained. Author

N74-29776*# ITT Aerospace/Optical Div., Fort Wayne, Ind.
SURFACE COMPOSITION MAPPING RADIOMETER INSTRUMENT Final Engineering/Project Report
[1974] 144 p refs
(Contract NAS5-21112)
(NASA-CR-139034) Avail: NTIS HC $10.25 CSCL 14B

The design, development, and fabrication of a three-channel scanning radiometer are discussed. The instrument was flown on Nimbus 5 satellite and measured infrared energy in the 8.3 to 9.3, 10.2 to 11.2, and 0.8 to 1.1 micron spectral regions. The instrument parameters are presented. Theoretical discussions of the instrument subassemblies are provided. Operational details of the mechanical and electrical portions of the instrument are included. Author

N74-29777# Sandia Labs., Albuquerque, N.Mex.
PHOTOINSTRUMENTATION TECHNOLOGY, A TWO YEAR PROGRAM
O. G. Bates Jan. 1974 34 p refs
(Contract AT(29-1)-789)
(SLA-73-1052) Avail: NTIS HC $3.50

The Photoinstrumentation Technology Program trains technicians in creative design and implementation of high-speed and other scientific photographic recordings. The specific instructional objectives and the program curriculum are presented. Author (NSA)

N74-29778# Frankford Arsenal, Philadelphia, Pa.
THE RHO-THETA SCANNER
Joseph P. Jacobson Nov. 1973 18 p
(DA Proj. 1T0-61101-A-91A)
(AD-779411; FA-M73-33-1) Avail: NTIS CSCL 17/5

Several novel scanner concepts were conceived and investigated. The purpose of this work was to find a way to reduce the complexity of imaging and tracking systems. The resulting identification of the Rho-Theta scanner as a promising candidate led to a concentration of effort on this concept. The rho-theta scanner would utilize two superimposed circular reticles; one reticle bearing a radial slot and the second reticle inscribed with an Archimedian spiral slot. The two reticles would rotate and the resulting resolution area would scan the device field-of-view. Geometric and mechanical design considerations were investigated. It was concluded that a rho-theta scanner could be fabricated in breadboard form, and the concept is now ready for exploratory development. Author (GRA)

N74-29779# Human Engineering Labs., Aberdeen Proving Ground, Md.
STATE-OF-THE-ART REVIEW OF ALTIMETER DISPLAYS Final Report
Anthony J. Antenucci Mar. 1974 12 p refs
(AD-779408; HEL-TN-4-74) Avail: NTIS CSCL 01/4

A literature review was performed to determine what work has been done to date in developing an improved altimeter. Most of the previous studies have been comparisons of different types of altimeters (e.g., counter drum pointer versus counter pointer). These tests have a drawback in that the results may have been biased by an altimeter which was a poor representative of its particular type. Author (GRA)

N74-29780# Aerojet Electrosystems Co., Azusa, Calif.
DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 1: SYSTEM DEFINITION STUDIES Final Design Report, 6 Jun. 1972 - 5 Jun. 1973
Jun. 1973 271 p refs
(Contract DOT-CG-22170-A)
(AD-779482; AESC-1745FR-1-Vol-1; USCG-D-45-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. The surveillance system consists of an X-band side-looking radar system, a 37 GHz passive microwave imaging system, a multispectral low light level TV system, a multichannel infrared line scanner, a position reference system, and a real-time processor/display console. Volume I describes the effort and results associated with the systems analysis and optimization effort. It includes investigation of annotation and navigation systems, various installation and pointing and stabilization techniques for low light level television camera, further investigation of alternative radar systems and various other areas. GRA

N74-29781# Aerojet Electrosystems Co., Azusa, Calif.
DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 2: DESIGN REPORT Final Design Report, 6 Jun. 1972 - 5 Jun. 1973
Jun. 1973 407 p refs
(Contract DOT-CG-22170-A)
(AD-779483; AESC-1745FR-1-Vol-2; USCG-D-46-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. Volume 2 gives details of the overall system design. GRA

N74-29782# Aerojet Electrosystems Co., Azusa, Calif.
DEVELOPMENT OF A PROTOTYPE AIRBORNE OIL SURVEILLANCE SYSTEM. VOLUME 3: SUBSYSTEM SPECIFICATIONS Final Design Report, 6 Jun. 1972 - 5 Jun. 1973
Jun. 1973 156 p refs
(Contract DOT-CG-22170-A)
(AD-779484; AESC-1745FR-1-Vol-3; USCG-D-47-74) Avail: NTIS CSCL 13/2

The document provides details of the prototype Airborne Oil Surveillance System (AOSS) design. This volume is a compilation of the specifications, drawing lists, Phase I and II Work Breakdown Structure and the Spare Parts List for the procured sensors. This documentation has been assembled in one area to serve as reference documentation for the various Phase I tasks. GRA

N74-29783# Utah State Univ., Logan. Space Science Lab.
PROBE MEASUREMENTS IN A CONTROLLED LABORATORY ENVIRONMENT
Richard H. Bishop and Earl F. Pound 22 Aug. 1973 57 p refs
(Contract F19628-72-C-0255)
(AD-779493; AFCRL-TR-73-0564; SR-1) Avail: NTIS HC $3.75 CSCL 04/1

RF impedance probes have been used for many years as a means of measuring the electron density in the ionosphere. Although existing theories used to calculate these electron density profiles are apparently reasonably good, no thorough check had ever been made in a controlled laboratory environment. For this reason it was decided to conduct a series of measurements in

a controlled laboratory plasma to substantiate the accuracy of RF impedance probe theory and to determine the problems associated with this type of study. The plasma tank of Office National d'Etudes et de Recherches Aerospatiales (ONERA) Paris, France, was chosen as the best available chamber in which to conduct such a program. The results of this study and recommendations for future studies are presented. Author (GRA)

N74-29786* Kanner (Leo) Associates, Redwood City, Calif.
MULTIPLE-POINT UNIT FOR REMOTE AUTOMATIC SPECTRAL ANALYSIS
O. A. Aleksandrov, V. A. Ivanov, V. N. Karovetskiy, A. N. Lapenko, and B. N. Masharskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 1-2 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 5-6 (For availability see N74-29785 19-15)
CSCL 14B

N74-29787* Kanner (Leo) Associates, Redwood City, Calif.
SYSTEM FOR AUTOMATED MEASUREMENT OF FULL-SCALE NOISES AND VIBRATIONS
G. S. Lyubashevskiy, B. D. Tartakovskiy, and V. E. Frishberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 3-6 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 7-9 (For availability see N74-29785 19-15)
CSCL 14B

N74-29789* Kanner (Leo) Associates, Redwood City, Calif.
USE OF THE MATHEMATICAL MODELLING METHOD FOR THE INVESTIGATION OF DYNAMIC CHARACTERISTICS OF ACOUSTICAL MEASURING INSTRUMENTS
Yu. M. Vasilyev and L. F. Lagunov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 10-12 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 12-14 (For availability see N74-29785 19-15)
CSCL 14B

N74-29793* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATIC MEASURING DEVICE FOR OCTAVE ANALYSIS OF NOISE
D. L. Memnonov and A. M. Nikitin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 25-27 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 24-26 (For availability see N74-29785 19-15)
CSCL 14B

N74-29798* Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION OF A MECHANICAL VIBRATION SYSTEM
S. S. Korablev, Yu. Ye. Filatov, and V. I. Shapin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 36-37 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 35-36 (For availability see N74-29785 19-15)
CSCL 14B

N74-29836* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF CORRELATION RECEIVING SYSTEMS FOR DETECTION OF NOISE SOURCES AT SHORT DISTANCES
V. V. Tarabarin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 171-175 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 153-156 (For availability see N74-29785 19-15)
CSCL 14B

N74-29837* Kanner (Leo) Associates, Redwood City, Calif.
NEW PRINCIPLES OF CONSTRUCTION OF ELECTROMECHANICAL VIBRATION INDUCERS
K.-A. P. Ashmonas, R. Yu. Bansevichyus, A. I. Vaznelis, and K. M. Ragulskis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 176-178 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 157-159 (For availability see N74-29785 19-15)
CSCL 14B

N74-29841* Kanner (Leo) Associates, Redwood City, Calif.
VIBRATIONAL SENSITIVITY OF A MEASURING INSTRUMENT AND METHODS OF INCREASING THE ACCURACY OF ITS DETERMINATIONS
Yu. S. Mironov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 188-189 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 168 (For availability see N74-29785 19-15)
CSCL 14B

N74-29842* Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF THE VIBRATION OF STRUCTURES WITH A THREE-COMPONENT VIBRATION SENSOR
V. V. Yeskov, V. S. Konevalov, and A. S. Nikiforov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 190-192 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 169-171 (For availability see N74-29785 19-15)
CSCL 14B

N74-29843* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF ACCOUNTING FOR INSTRUMENTAL DISTORTIONS DURING OBSERVATION OF SIGNALS
K. A. Kazlauskas and Ts. Ts. Paulauskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 193-194 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 172 (For availability see N74-29785 19-15)
CSCL 14B

N74-29851* Kanner (Leo) Associates, Redwood City, Calif.
A NEW METHOD OF MEASUREMENT OF TENSION ON A MOVING MAGNETIC TAPE
A. K. Kurtinaytis and Ye. S. Lauzhinskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 229-231 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 202-204 (For availability see N74-29785 19-15)
CSCL 14B

N74-29852* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRICAL AND ACOUSTICAL RESONANCES OF VIBRATORS
M. V. Khvingiya, T. G. Tatishvili, and A. G. Zilberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 235-238 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 207-211 (For availability see N74-29785 19-15)
CSCL 14B

N74-29867* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL RESEARCH ON AEROSTATIC SUSPENSIONS
L. A. Bushma *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 289-291 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protosessam" Kaunas, KPI Press, 1972 p 260-262 (For

availability see N74-29785 19-15)
CSCL 14B

N74-29871* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF THE DYNAMICS AND FREQUENCY SPECTRUM SYNTHESIS OF AN OPTICAL-MECHANICAL SCANNING DEVICE
A. I. Andryushkyavichyus, A. L. Kumpikas, and K. L. Kumpikas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 301-305 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 271-273 (For availability see N74-29785 19-15)
CSCL 14B

N74-29891* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTRODUCTORY REMARK TO M-518 MULTIPURPOSE FURNACE EXPERIMENTS PERFORMED ON SKYLAB
William R. Adams *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 131-132 (For availability see N74-29885 19-15)
CSCL 14B

N74-29906* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING PAYLOADS FOR SPACELAB
K. R. Taylor, R. L. Hammel (TRW Systems Group, Redondo Beach, Calif.), A. G. Smith (TRW Systems Group, Redondo Beach, Calif.), P. R. Mock (TRW Systems Group, Redondo Beach, Calif.), and R. D. Stevenson (TRW Systems Group, Redondo Beach, Calif.) *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 525-564 refs (For availability see N74-29905 19-15)
CSCL 14B

N74-29908* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FURNACE SYSTEMS DEVELOPMENT
B. R. Aldrich *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 581-593 refs (For availability see N74-29905 19-15)
CSCL 14B

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-29784*# Commonwealth Scientific Corp., Alexandria, Va.
DEVELOPMENT OF A METHOD FOR FABRICATING METALLIC MATRIX COMPOSITE SHAPES BY A CONTINUOUS MECHANICAL PROCESS Quarterly Progress Report, 15 Oct. 1973 - 15 Mar. 1974
A. P. Divecha 15 Mar. 1974 46 p
(Contract NAS8-27010)
(NASA-CR-120248; QPR-11) Avail: NTIS HC $5.50 CSCL 13H

Attempts made to develop processes capable of producing metal composites in structural shapes and sizes suitable for space applications are described. The processes must be continuous and promise to lower fabrication costs. Special attention was given to the aluminum boride (Al/b) composite system. Results show that despite adequate temperature control, the consolidation characteristics did not improve as expected. Inadequate binder removal was identified as the cause responsible. An Al/c (aluminum-graphite) composite was also examined. Author

N74-29785*# Kanner (Leo) Associates, Redwood City, Calif.
CYBERNETIC DIAGNOSTICS OF MECHANICAL SYSTEMS WITH VIBRO-ACOUSTIC PHENOMENA
K. M. Ragulskis, ed. Washington NASA Jun. 1973 329 p refs Transl. into ENGLISH of the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 292 p
(Contract NASw-2481)
(NASA-TT-F-14899) Avail: NTIS HC $19.50 CSCL 14D

Vibroacoustic measuring and analytical methods are reported for evaluating operational aspects of mechanical and structural systems. For individual titles, see N74-29786 through N74-29875.

N74-29786* Kanner (Leo) Associates, Redwood City, Calif.
MULTIPLE-POINT UNIT FOR REMOTE AUTOMATIC SPECTRAL ANALYSIS c14
O. A. Aleksandrov, V. A. Ivanov, V. N. Karovetskiy, A. N. Lapenko, and B. N. Masharskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 1-2 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 5-6 (For availability see N74-29785 19-15)
CSCL 14B

An experimental model of a mechanical spectrometer is reported that permits vibration measurements at 297 points on a mechanical device and processes this information by digital computer for automatic printout. G.G.

N74-29787* Kanner (Leo) Associates, Redwood City, Calif.
SYSTEM FOR AUTOMATED MEASUREMENT OF FULL-SCALE NOISES AND VIBRATIONS c14
G. S. Lyubashevskiy, B. D. Tartakovskiy, and V. E. Frishberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 3-6 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 7-9 (For availability see N74-29785 19-15)
CSCL 14B

On-line devices are described for measuring the electrical spectrum of a signal in the presence of full scale noise and vibrations. The system includes a set of parallel filters with detectors at the filtration channel outlet. A reciprocal spectral density matrix is used to process the information contained in the interacting signals from various noise and vibration sources. G.G.

N74-29788* Kanner (Leo) Associates, Redwood City, Calif.
METHOD FOR EXPERIMENTAL DETERMINATION OF THE CONTRIBUTION OF INDIVIDUAL SOURCES TO TOTAL NOISE
N. A. Rubichev *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 7-9 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 10-11 (For availability see N74-29785 19-15)
CSCL 13I

Multiple noise sources generating signals in a mechanical device are analyzed by considering the medium transmitting the sound as linear, and by using a band filter with bandpass for synchronous detection and signal transformation. G.G.

N74-29789* Kanner (Leo) Associates, Redwood City, Calif.
USE OF THE MATHEMATICAL MODELLING METHOD FOR THE INVESTIGATION OF DYNAMIC CHARACTERISTICS OF ACOUSTICAL MEASURING INSTRUMENTS c14
Yu. M. Vasilyev and L. F. Lagunov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 10-12 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 12-14 (For availability see N74-29785 19-15)
CSCL 14B

The schematic diagram of a noise measuring device is presented that uses pulse expansion modeling according to the peak or any other measured values, to obtain instrument readings at a very low noise error. G.G.

N74-29790* Kanner (Leo) Associates, Redwood City, Calif.
INDUSTRIAL REALIZATION OF A DIRECT FOURIER TRANSFORM IN AUTOMATED EXPERIMENTAL DATA PROCESSING SYSTEMS **c08**
G. S. Lyubashevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 13-16 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 15-17 (For availability see N74-29785 19-15)
CSCL 09B

Fourier processing of automatic signals transforms direct current voltage into a numerical form through bandpass filtration in time-pulse multiplying devices. It is shown that the ratio of the interference energy to the useful signal energy is inversely proportional to the square of the product of the depth of the width modulation and the ratio of the time constant averaging to the cross-multiplied signals. G.G.

N74-29791* Kanner (Leo) Associates, Redwood City, Calif.
DISCRETE REGULATION OF TRANSFER FUNCTION OF A CIRCUIT IN EXPERIMENTAL DATA AUTOMATIC COLLECTION AND PROCESSING SYSTEMS **c09**
G. S. Lyubashevskiy, A. A. Petrov, I. A. Sanayev, and V. E. Frishberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic phenomena (NASA-TT-F-14899) Jun. 1973 p 17-20 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 18-20 (For availability see N74-29785 19-15)
CSCL 09E

A device for discrete control of the circuit transfer function in automatic analog data processing systems is reported that coordinates the dynamic range of the vibration level change with the signal range of the processing device output. Experimental verification of the device demonstrates that its maximum control speed does not exceed 0.5 sec for a frequency nonuniformity of about 10%. G.G.

N74-29792* Kanner (Leo) Associates, Redwood City, Calif.
ESTIMATION OF ERRORS IN MEASUREMENT OF STATIONARY SIGNALS FROM A CONTINUOUS FREQUENCY BAND SPECTRUM **c10**
V. A. Ivanov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 21-24 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 21-23 (For availability see N74-29785 19-15)
CSCL 09C

The design of an apparatus for frequency analyses on signals with continuous spectra is reported. Filter statistical characteristics are used to expand the dynamic range to 80 db and more or to limit the input signal spectra. A series connection of several band filters gives the most effective results. Author

N74-29793* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATIC MEASURING DEVICE FOR OCTAVE ANALYSIS OF NOISE **c14**
D. L. Memnonov and A. M. Nikitin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 25-27 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 24-26 (For availability see N74-29785 19-15)
CSCL 14B

An automatic decoder is described that counts noise levels by pulse counters and forms audio signals proportional in duration to the total or to one of the octave noise levels. Automatic ten fold repetition of the measurement cycle is provided at each measurement point before the transition to a new point is made. G.G.

N74-29794* Kanner (Leo) Associates, Redwood City, Calif.
APPARATUS FOR MONITORING THE CONDITION OF MINING MACHINERY TRANSMISSIONS
I. A. Levites and I. G. Fiks *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 28-29 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 27-28 (For availability see N74-29785 19-15)
CSCL 13I

A portable apparatus is reported for measuring vibro-acoustic signals of mining machine transmissions for analysis of vibration levels and for damage detection. An automatic recording device connected to the detection channels permits measurments of the overall level of vibroacceleration as well as of the level in octave bands. G.G.

N74-29795* Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF VIBRATION RATE OF MANUALLY OPERATED PERCUSSION MACHINES
Ye. V. Aleksandrov and Yu. V. Flavitskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 30-31 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 29 (For availability see N74-29785 19-15)
CSCL 13I

A special apparatus for measurement of accelerations of between 1 and 5000 g and shock stress pulses from 20 kg/cu cm up, with durations of 50.1 million sec and higher was designed and built. The amplitudes and shapes of the peak vibroshock pulses, arising during operation of a hammer, are obtained; the recording time of the continuous process is determined by the time of one revolution of the drum of a specially made mechanical photo attachment. Author

N74-29796* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF PARAMETERS OF A MACHINE SET, ACCORDING TO AMPLITUDES OF VIBRATION, IN THE CASE OF COAXIAL MISALIGNMENT OF SHAFTS
M. S. Rondomanskas, K. M. Ragulskis, Rem. A. Ionushas, and R. Yu. Bansevichyus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 32-33 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 30-32 (For availability see N74-29785 19-15)
CSCL 13I

Dynamic synthesis of the coupling parameters permits the building of coaxially aligned connected machines with very small disturbing forces. Considered is the case of two machines connected by a flexible coupling; one machine is installed on shock absorbers with four degrees of freedom. A movement leveling synthesis considers the coaxial nonalignment parameters for the shaft arrangement and determines the optimum coupling rigidity at which the vibration amplitude is at a minimum. G.G.

N74-29797* Kanner (Leo) Associates, Redwood City, Calif.
SOME QUESTIONS OF AN OPTIMUM PROBABILITY SYNTHESIS OF DYNAMIC METALWORKING MACHINE SYSTEMS
S. A. Dobrynin and G. I. Firsov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 34 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 33 (For availability see N74-29785 19-15)
CSCL 13I

Attempts were made to develop a dynamic metal working machine tool system using probability information on external factors and independent disturbances of the parameters. The problem was optimized in two stages: (1) creation of mathematical models under conditions determined by input influences, and (2) processing the results of calculations obtained on such models. Data were obtained on the patterns of distribution of dynamic quality characteristics of the tool, vibration frequencies and amplitudes, attenuation coefficients, and duration of a transition process. These data were obtained using a digital computer, statistical test methods, or logical possibility trees. E.H.W.

N74-29798* Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION OF A MECHANICAL VIBRATION SYSTEM **c14**

S. S. Korablev, Yu. Ye. Filatov, and V. I. Shapin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 36-37 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 35-36 (For availability see N74-29785 19-15)
CSCL 14B

The actual values of the parameters of a precision instrument assembly vibration system are determined according to experimental amplitude-frequency characteristics. The assembly is considered as a complex mechanical vibrating system, consisting of elements with concentrated and distributed parameters. A calculation procedure was compiled. Author

N74-29799* Kanner (Leo) Associates, Redwood City, Calif.
CONSTRUCTION OF A MATHEMATICAL MODEL OF THE HUMAN BODY, TAKING THE NONLINEAR RIGIDITY OF THE SPINE INTO ACCOUNT c04
K. K. Glukharev, N. I. Morozova, B. A. Potemkin, V. S. Solovyev, and K. V. Frolov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 38-40 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 37-38 (For availability see N74-29785 19-15)
CSCL 06P

A mathematical model of the human body was constructed, under the action of harmonic vibrations, in the 2.5-7 Hz frequency range. In this frequency range, the model of the human body as a vibrating system, with concentrated parameters is considered. Vertical movements of the seat and vertical components of vibrations of the human body are investigated. Author

N74-29800* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE REACTIONS OF SKIN PANELS IN RELATION TO DURATION OF ACOUSTICAL LOADING c32
V. Ye. Kvitka and G. I. Kernes *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 41-43 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 39-41 (For availability see N74-29785 19-15)
CSCL 20K

Certain characteristics of the reactions of typical skin panels of a passenger aircraft to acoustical loading are being investigated, for development of an objective method of diagnostics for skin condition, under the operations and maintenance sections of civil aviation. There are a number of difficulties connected with the solution of this problem. The reactions of skin panels exposed to the noises of the exhaust jets are dependent on the aircraft operating conditions, the geometric parameters and limiting conditions of the panels. Author

N74-29801* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBROSHOCK STABILITY OF A MECHANICAL CONTACT BY MEASUREMENT OF ITS RESISTANCE c09
S. G. Butsevichyus and V.-S. S. Zaretskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 44-47 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 42-45 (For availability see N74-29785 19-15)
CSCL 09A

Experimental results on the vibration and impact strength of a contact junction are presented, using contact resistance measurement. The contact pressure, condition, and cleanliness of surfaces are also considered, as well as the type and intensity of mechanical action. Author

N74-29802* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATIONS IN ELECTRIC POWER TRANSMISSION LINES c32
I. I. Vitkus, T. P. Matekonis, and K. M. Ragulskis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 48-49 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 46-47 (For availability see N74-29785 19-15)
CSCL 20K

Research was begun into the dynamic characteristics of wires, including the self-damping properties. A series of wire insulator fastenings, with and without dampers, was also developed. Author

N74-29803* Kanner (Leo) Associates, Redwood City, Calif.
ANALYTIC DESCRIPTION OF VIBRATIONS IN A PIPING SYSTEM WITH PULSATING FLOW c32
G. P. Bosnyatskiy, R. I. Grossman, A. A. Kozobkov, and A. I. Koppel *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 51-52 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 49-50 (For availability see N74-29785 19-15)
CSCL 20K

Various calculation schemes were proposed for describing vibrations in a piping system with pulsating flow. Methods were selected and applied according to the type of irregularities examined: concentrated ones, extended ones, or complex ones. The selection of a method also depends on comparability of the extent of the irregularities with the pressure wavelength and velocity in the flow. Relations were found which permit a description of the interaction of a pulsating flow with any irregularity in the system. For complex systems with varying temperatures and some irregularities, relations were obtained, which reflect the varying phase displacement of the forces in these irregularities. The effect of the frictional torque on pipeline supports, in the presence of flexural and torsional vibrations was investigated, on the assumption that the frictional torque depends linearly on the angular velocity. Author

N74-29804* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF A DIGITAL COMPUTER FOR CALCULATION OF ACOUSTIC FIELDS OF COMPLEX VIBRATING STRUCTURES BY THE RECIPROCITY PRINCIPLE c32
A. V. Rimskiy-Korsakov and Yu. I. Belousov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 53-56 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 51-53 (For availability see N74-29785 19-15)
CSCL 20K

A program was compiled for calculating acoustical pressure levels, which might be created by vibrations of complex structures (an assembly of shells and rods), under the influence of a given force, for cases when these fields cannot be measured directly. The acoustical field is determined according to transition frequency and pulse characteristics of the structure in the projection mode. Projection characteristics are equal to the reception characteristics, for vibrating systems in which the reciprocity principle holds true. Characteristics in the receiving mode are calculated on the basis of experimental data on a point pulse space velocity source (input signal) and vibration response of the structure (output signal). The space velocity of a pulse source, set at a point in space r, where it is necessary to calculate the sound field of the structure p(r,t), is determined by measurements of acoustic pressure, created by a point source at a distance R. The vibration response is measured at the point where the forces F and f exciting the system should act. Author

N74-29805* Kanner (Leo) Associates, Redwood City, Calif.
STATISTICAL PARAMETERS OF REVERBERATING FIELDS, CALCULATED BY COMPUTER c32
I. V. Lebedeva and L. G. Rubanova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 57-60 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 54-56 (For availability see N74-29785 19-15)
CSCL 20K

A method, developed for making measurements in reverberation chambers in the steady state mode, is reported. Spatial distribution patterns of the square of the sound pressure vs

type of exciting signal were produced theoretically and checked experimentally in a reverberation chamber. Results of measurements of spatial irregularities of the field with pure tones and with noise bands in the 200 to 2,000 Hz frequency range were used for calculating statistical parameters of the reverbation fields by computer. The calculation program included determination of density probability function, integral distribution pattern, mathematical expectation, normalized dispersion of the mean square of the pressure. E.H.W.

N74-29806* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL ESTIMATION OF THE STATISTICAL PARAMETERS OF VIBRATIONS OF A SHELL (USING A DIGITAL COMPUTER), 1 **c32**
B. A. Kanayev, G. S. Lyubashevskiy, and B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 61-67 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 57-63 (For availability see N74-29785 19-15)
CSCL 20K

The distribution pattern of the amplitudes of vibrations, measured at various points on the surface of a shell, stimulated by a point source of harmonic force in the sound frequency range was studied experimentally. This pattern permits a valid spacing estimate to be carried out of the average structural characteristics of the vibrations, which are used for both estimation of the vibration excitability of the structure and for estimation of the effectiveness of use of a vibration-absorbing covering. Author

N74-29807* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL ESTIMATION OF THE STATISTICAL PARAMETERS OF VIBRATIONS OF A SHELL (USING A DIGITAL COMPUTER), 2 **c32**
B. A. Kanayev, G. S. Lyubashevskiy, and B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 68-73 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 64-69 (For availability see N74-29785 19-15)
CSCL 20K

The statistical characteristics of complex variation amplitudes of shells excited by harmonic force sources in the sound frequency range are examined. Vibrations were measured with a multichannel unit, permitting the component values of a complex vibration amplitude for the i-th measurement point to be obtained at each measured point. An estimation was also made of the nature of the vibration field structure. Author

N74-29808* Kanner (Leo) Associates, Redwood City, Calif.
A MATHEMATICAL MODELING METHOD FOR DETERMINATION OF LOCAL VIBROACOUSTIC CHARACTERISTICS OF STRUCTURES **c32**
B. D. Tartakovskiy and A. B. Dubner *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 74-77 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 70-72 (For availability see N74-29785 19-15)
CSCL 20K

A method is proposed for determining vibroacoustic characteristics from the results of measurements of the distribution of vibrational energy in a structure. The method is based on an energy model of a structure studied earlier. Equations are written to describe the distribution of vibrational energy in a hypothetical diffuse energy state in structural elements. Author

N74-29809* Kanner (Leo) Associates, Redwood City, Calif.
OPTIMIZATION OF PARAMETERS OF THREE-LAYER VIBRATION-ABSORBING STRUCTURES USING A DIGITAL COMPUTER **c32**
T. M. Avilova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 78-80 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 73-75 (For availability see N74-29785 19-15)
CSCL 20K

Flexural vibration damping was studied in three layer vibration absorbing structures using a digital computer. Optimum parameters including thickness of layers, complex modulus of elasticity, complex shear modulus and density of the vibration absorbing material, and the modulus of elasticity, density, and frequencies of the metal layers were examined. E.H.W.

N74-29810* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATION OF MEASUREMENT OF SPATIAL DAMPING PARAMETERS **c32**
A. N. Akolzin, A. I. Vyalyshev, B. D. Tartakovskiy, and T. I. Shmeleva *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 81-82 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 76-77 (For availability see N74-29785 19-15)
CSCL 20K

A traveling wave unit was built to process measurement data on spatial damping parameters and to simplify statistical treatment of the results. Mean values of the loss coefficient, lengths of flexual waves, and wave propagation velocities for a given set of discrete functions were determined. Results are given in a table. Author

N74-29811* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF A DIGITAL COMPUTER FOR INVESTIGATION OF THE DYNAMIC CHARACTERISTICS OF A MAN WHILE PRESSING VERTICALLY DOWNWARD WITH THE STRAIGHT ARM ON THE HANDLE OF A VIBRATOR (INSTRUMENT) **c05**
A. I. Zazhivikhina, G. S. Rosin, and Ye. I. Ryzhov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 83-86 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 78-81 (For availability see N74-29785 19-15)
CSCL 05E

The dynamic characteristics of a man were investigated by the resonance method, by means of recordings of the amplitude-frequency characteristics of a vibrator straight arm human body system on a standard automatic recorder. Experiments were carried out with a specially constructed vibrator, the moving system of which was fastened to a bronze suspension with small losses. Vibrations of the handle, fastened to the moving system, were recorded with an accelerometer. The mass of the moving system m, rigidity of the suspension k and friction coefficient r of the vibrator (calibration) were determined by exact formulas. Author

N74-29812* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF SOURCES OF DISTURBANCES AND DISTRIBUTION OF VIBRATIONS OVER THE WIDTH OF A TAPE IN TAPE-FEED MECHANISMS
A.-B. B. Kenstavichyus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 87-88 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 82-83 (For availability see N74-29785 19-15)
CSCL 13I

Disturbances created by certain assemblies and components of tape-feed mechanisms (TFM) and acting on a moving magnetic tape are studied. The method, based on elements of digital logic, is established by stress-strain diagrams of the longitudinal deformations and vibrations across the width of a magnetic tape. Experimental studies were carried out for determination of the functional relationships of longitudinal deformations in a section of magnetic tape to the magnitude of roller play, tension vibrations rate of movement, and elasticity of magnetic tapes. A block diagram of the measurements is shown. Appropriate digital computer algorithms and programs were proposed for statistical analysis of the data obtained. Estimates of the mathematical expectation, dispersion, intercorrelation function, energy spectral density, and distribution pattern of the random process values were calculated. Author

N74-29813* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF VIBRATION CHARACTERISTICS OF THIN PLATES COVERED WITH A THIN VISCOUS LAYER **c32**
A. K. Damashyavichyus, I. Sh. Rakhmatulin, V. K. Naynis, and Yu. K. Konenkov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 89-90 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 84 (For availability see N74-29785 19-15)
CSCL 20K

The equation of motion was used to examine the problem of vibrations of a thin elastic plate covered with a thin viscous layer. Mathematical formulation and the solution of the problem are given. Author

N74-29814* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF THE TECHNICAL CONDITION OF ANTIFRICTION BEARINGS
A.-E. Yu. Vitkute, V. A. Pechkis, K. M. Ragulskis, and A. Yu. Yurkauskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 91-99 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 85-93 (For availability see N74-29785 19-15)
CSCL 13I

Shock pulse measurements that express the characteristic curves of rotational bearing resistance are used to diagnose possible deficiencies. Spectral analysis of frequency vibration tracings establishes probable causes for various anomalies in the geometric shape, surface frequency, contamination, etc.
G.G.

N74-29815* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF THE VIBRATIONS OF COMPLEX ROTOR SYSTEMS **c02**
I. Yu. Yugraytis, K. M. Ragulskis, Rem. A. Ionushas, and I. P. Karuzhene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 100-102 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 94-96 (For availability see N74-29785 19-15)
CSCL 01C

The parameters of the imbalance of a complex rotor system, having n parallel rotors and having six degrees of freedom, can be determined from the parameters of the vibrations of two appropriate degrees of freedom. This considerably simplifies diagnostics of the vibrations of complex rotor systems. Author

N74-29816* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF LOAD VIBRATIONS AT THE INLET OF A MECHANISM **c32**
V. P. Dontsu, Z. T. Dontsu, K. M. Ragulskis, and N. M. Savka *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 103-104 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 97-98 (For availability see N74-29785 19-15)
CSCL 20K

The torque of a drive shaft in a magnetic recording device was studied by oscillographic recordings. Statistical evaluation of the dynamic spectral densities showed that the principle source of disturbing forces is loading in the drive shaft radial play.
G.G.

N74-29817* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATIONS OF WORKING ELEMENTS OF A TWO COORDINATE SCANNER **c32**
K. L. Kumpikas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 105-106 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 99-100 (For availability see N74-29785 19-15)
CSCL 20K

Radial and axial vibration measurements on the scanning disk and the data storage board of an optical-mechanical scanner are evaluated. Statistical processing of the observational data establishes the excitation source and determines the effect of disk torsional vibrations on the data storage board.
G.G.

N74-29818* Kanner (Leo) Associates, Redwood City, Calif.
A METHOD OF DIAGNOSTICS OF THE DYNAMIC STABILITY OF THE CARRIER IN A MAGNETIC RECORDING PLAYBACK CIRCUIT **c07**
G. A. Petrulis and I. Gasyunas *In its* Cybernitic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 107-109 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 101-103 (For availability see N74-29785 19-15)
CSCL 14C

Graphical plotting of the dynamic instability is used to diagnose carrier behavior according to a given carrier tension fluctuation spectrum. G.G.

N74-29819* Kanner (Leo) Associates, Redwood City, Calif.
COMPUTER DIAGNOSTICS OF SHOCK PROCESSES **c32**
A.-A. P. Laurutis and B. V. Rudalvis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 110-114 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticceskim Protsessam" Kaunas, KPI Press, 1972 p 104-108 (For availability see N74-29785 19-15)
CSCL 20K

A cathode ray electrostatic image recorder for shock processes is reported that automatically processes and visually displays recorded shock pulses for spectral analysis. G.G.

N74-29820* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF NOISE IN GEAR TRANSMISSIONS BY THE METHOD OF MATHEMATICAL SMOOTHING OF EXPERIMENTS
B. T. Sheftel, G. K. Lipskiy, P. P. Ananov, and I. K. Chernenko *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 115-117 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 109-110 (For availability see N74-29785 19-15)
CSCL 13I

A rotatable central component smoothing method is used to analyze rotating gear noise spectra. A matrix is formulated in which the randomized rows correspond to various tests and the columns to factor values. Canonical analysis of the obtained regression equation permits the calculation of optimal speed and load at a previous assigned noise level. G.G.

N74-29821* Kanner (Leo) Associates, Redwood City, Calif.
DETERMINATION OF CHANGES IN PROPERTIES OF RANDOM PROCESSES WITH AN ACCURACY ASSIGNED IN ADVANCE
L. A. Telksnis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 119-122 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 112-114 (For availability see N74-29785 19-15)
CSCL 13I

A probability model of random processes is used to calculate the probability characteristics which exist in the random problem of vibroacoustic processes in machine operations. G.G.

N74-29822* Kanner (Leo) Associates, Redwood City, Calif.
THE ROLE OF STATISTICAL MEASUREMENTS IN EXPERIMENTAL RESEARCH **c19**
V. V. Olshevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 123-126 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 115-117 (For

availability see N74-29785 19-15)
CSCL 12A

A quantitative model of a research object is formulated that contains the probability characteristics of random processes. The model is subsequently used in acoustical metrology for prognosis of previously unknown properties of the object, for solutions of reciprocal problems, etc. G.G.

N74-29823* Kanner (Leo) Associates, Redwood City, Calif.
INTERPRETATION OF THE RESULTS OF STATISTICAL MEASUREMENTS **c19**
V. V. Olshevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 127-130 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 118-120 (For availability see N74-29785 19-15)
CSCL 12A

For random processes, the calculated probability characteristic, and the measured statistical estimate are used in a quality functional, which defines the difference between the two functions. Based on the assumption that the statistical measurement procedure is organized so that the parameters for a selected model are optimized, it is shown that the interpretation of experimental research is a search for a basic probability model. F.O.S.

N74-29824* Kanner (Leo) Associates, Redwood City, Calif.
LP-SEARCH AND ITS USE IN ANALYSIS OF THE ACCURACY OF CONTROL SYSTEMS WITH ACOUSTICAL MODELS **c19**
V. I. Sergeyev, I. M. Sobol, R. B. Statnikov, and I. N. Statnikov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 131-133 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 121-123 (For availability see N74-29785 19-15)
CSCL 12A

The LP-search is proposed as an analog of the Monte Carlo method for finding values in nonlinear statistical systems. It is concluded that: To attain the required accuracy in solution to the problem of control for a statistical system in the LP-search, a considerably smaller number of tests is required than in the Monte Carlo method. The LP-search allows the possibility of multiple repetitions of tests under identical conditions and observability of the output variables of the system. F.O.S.

N74-29825* Kanner (Leo) Associates, Redwood City, Calif.
ALGORITHM FOR IDENTIFICATION OF A SINGLE CLASS **c19**
V. A. Kaminskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 134-138 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 124-126 (For availability see N74-29785 19-15)
CSCL 12A

The class of nonlinear dynamic systems, which is described by the integral Hammerstein operator is discussed. The input and output signals of the system, the nonlinear amplification coefficient, and weighting function are broken down by linear-independent functions in Hermite and Laguerre polynomials. The algorithm for calculating parameter estimates, and the reduction of the estimates are discussed along with generalization in the case of a multidimensional system, and the physical interpretation of the examined class of systems. F.O.S.

N74-29826* Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION OF AN OBJECT BY INPUT AND OUTPUT SPECTRAL CHARACTERISTICS **c32**
S. F. Redko and V. F. Ushkalov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 139-141 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 127-128 (For availability see N74-29785 19-15)
CSCL 20K

The problem is discussed of identification of a linear object of known structure, the movement of which is described by a system of differential equations of the type $y = Ay + Bu$, where y is an n-dimensional output vector, u is an m-dimensional vector of stationary, random disturbances (inputs), A and B are matrices of unknown parameters of the dimension, n x n and n x m, respectively. The spectral and reciprocal spectral densities of the inputs and outputs are used as the initial information on the object. Author

N74-29827* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF AN OBSERVATION OPERATION AND THE PROPERTY OF COMPLETE OBSERVABILITY OF NONLINEAR OBJECTS **c19**
Ye. A. Galperin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 142-144 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 129-130 (For availability see N74-29785 19-15)
CSCL 12A

The observation of nonlinear systems from incomplete information is discussed in terms of the equations for expressing the known dynamic properties. The observation operations synthesized are the integral, differential, and combined. F.O.S.

N74-29828* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF SPECTRA OF ACOUSTICAL SIGNALS AT THE OUTLET OF A NONLINEAR SYSTEM UNDER THE ACTION OF THE SUM OF THE HARMONIC SOURCES **c23**
Yu. D. Sverkunov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 145-149 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 131-134 (For availability see N74-29785 19-15)
CSCL 20A

The establishment of specific relations between components of the spectra at the outlet of a nonlinear system are discussed for simplifying the analysis of noise and vibration for an internal combustion engine. Author

N74-29829* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF STATISTICAL CHARACTERISTICS OF REDUCER VIBRATIONS AS DIAGNOSTIC SYMPTOMS
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 150-153 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 135-138 (For availability see N74-29785 19-15)
CSCL 13I

The results of a statistical analysis of the vibrations of the experimental RS-1 reducer stand, with a spiral-gear transmission, operating on a closed circuit, are presented. The analysis was carried out on the Minsk-2 and Minsk-32 digital computers, with two-channel analog-digital converter, built in the Institute of the Science of Mechanics. Two-dimensional distribution patterns, conditional dispersions and dispersion ratios were calculated. The octave-band-filtered first harmonics of the tooth frequency f sub z of the vibrations at two different measurement points were considered as the components of the vibration process to be analyzed. The regression lines, corresponding to different values of the loading torque, are presented. Since it was not the gear drive parameters which were determined by diagnostic methods, but the characteristics most sensitive to change in state of the object of the investigation, the loading torque, which is the simplest and most accessible for measurement, was chosen as the condition parameter. Author

N74-29830* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF BISPECTRA FOR PURPOSES OF ACOUSTICAL DIAGNOSTICS **c23**
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-44899) Jun. 1973 p 154-156 ref

Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 139-141 (For availability see N74-29785 19-15)
CSCL 20A

The results of bispectral analysis of an experimental reducer stand with a spur gear single stage transmission are studied for quantitatively estimating the nonlinearity of the system. F.O.S.

N74-29831* Kanner (Leo) Associates, Redwood City, Calif.
USE OF THE DISPERSION RATIO IN ESTIMATING THE NONLINEAR PROPERTIES OF AN OBJECT OF DIAGNOSIS c32
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, A. A. Kobrinskiy, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 157-159 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 142-143 (For availability see N74-29785 19-15)
CSCL 20K

An experimental investigation for estimating the nonlinearity of a diagnostic object was carried out on a single-stage, spur gear reducer. The linearity of the properties of spur gearing (including the linearity of its mode of operation) was tested. Torsional vibrations of the driven wheel and transverse (to the meshing plane) vibrations of the drive wheel on its support were taken as the two outputs of the object to be analyzed. The results of the investigation showed that the degree of nonlinearity of a reducing gear is essentially connected with its operating mode, so that different mathematical models of it can correspond to different values of the system parameters. Author

N74-29832* Kanner (Leo) Associates, Redwood City, Calif.
A USE OF REGRESSION ANALYSIS IN ACOUSTICAL DIAGNOSTICS OF GEAR DRIVES c19
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, A. A. Kobrinskiy, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 160-162 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 145-146 (For availability see N74-29785 19-15)
CSCL 12A

A study is presented of components of the vibration spectrum as the filtered first and second harmonics of the tooth frequency which permits information to be obtained on the physical characteristics of the vibration excitation process, and an approach to be made to comparison of models of the gearing. Regression analysis of two random processes has shown a strong dependence of the second harmonic on the first, and independence of the first from the second. The nature of change in the regression line, with change in loading moment, gives rise to the idea of a variable phase shift between the first and second harmonics.
Author

N74-29833* Kanner (Leo) Associates, Redwood City, Calif.
DIGITAL MODELING OF VIBROACOUSTICAL PROCESSES GENERATED BY GEARING
F. Ya. Balitskiy, M. D. Genkin, A. A. Kobrinskiy, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 163-165 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 147-148 (For availability see N74-29785 19-15)
CSCL 13I

The statistical nature of vibroacoustical processes in transmission gears was studied using mathematical models. Special attention was given to high frequency components of vibroacoustical processes generated by spur gearing. Equations are given for describing torsional and tranverse vibrations of pairs of gear wheels when meshing, taking into account the flexibility of their supports. E.H.W.

N74-29834* Kanner (Leo) Associates, Redwood City, Calif.
ALGORITHM FOR PROCESSING VIBROACOUSTICAL SIGNALS, FOR THE PURPOSE OF EARLY DETECTION OF CHANGE IN CONDITION OF A MACHINE
V. I. Povarkov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 166-168 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 149-151 (For availability see N74-29785 19-15)
CSCL 13I

The detection of defects in machines and their effects on machine condition were studied. Defects were determined from a comparison of changes in vibroacoustical signal curves in the machine with current characteristics. Data were obtained using probability distribution functions. E.H.W.

N74-29835* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF STUDY OF THE POSSIBILITY OF PREDICTING THE QUALITY OF TREATMENT IN POLISHING BY VIBROACOUSTICAL PROCESSES
V. V. Trubnikov and B. Ye. Bolotov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 169-170 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 152 (For availability see N74-29785 19-15)
CSCL 14D

The quality of vibroacoustical surface polishing and the deviation formation process of the surfaces were studied using a polishing mill unit. Data cover spectral composition of vibration accelerations and vibration displacements of individual elements, precision rotation of the polishing circle spindle in static and dynamic operation modes, spectral composition of relative vibrations of polishing circle and the part being processed, statistical and dynamic rigidity of individual elements, and APFC of the elastic system of the mill stand. The effect of individual spindle parameters on vibroacoustical characteristics of the system was also discussed as well as the spectrum measurement of the disturbing force. Author

N74-29836* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF CORRELATION RECEIVING SYSTEMS FOR DETECTION OF NOISE SOURCES AT SHORT DISTANCES c14
V. V. Tarabarin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 171-175 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 153-156 (For availability see N74-29785 19-15)
CSCL 14B

The use of a directional receiving system to detect noise sources masked by isotropic noise field interference at distances comparable with the distance between the two receivers, was discussed. Wide band noise was also examined. Results indicate the following limitations must be considered when using the method: (1) the system is directional only in the plane of the base, (2) directional power of the system is impaired with a decrease in the bandwidth of the noise source spectrum, (3) the system does not permit unambiguous determination of the direction to noise sources, located on both sides of the base line, and (4) the system has a comparatively low output signal-to-noise ratio. Author

N74-29837* Kanner (Leo) Associates, Redwood City, Calif.
NEW PRINCIPLES OF CONSTRUCTION OF ELECTROMECHANICAL VIBRATION INDUCERS c14
K.-A. P. Ashmonas, R. Yu. Bansevichyus, A. I. Vaznelis, and K. M. Ragulskis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 176-178 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 157-159 (For availability see N74-29785 19-15)
CSCL 14B

Electromechanical vibration inducers with high reliability and low noise level were created to study premature operating losses in their support bearings. An investigation was also made of the feasibility of developing stable synchronous operation of two

vibrational inducers, rigidly fastened to a solid body with and without flexible suspension. E.H.W.

N74-29838* Kanner (Leo) Associates, Redwood City, Calif.
STRUCTURAL ANALYSIS OF VIBROACOUSTICAL PROCESSES c32
A. P. Gromov, L. L. Myasnikov, Ye. N. Myasnikova, and B. A. Finagin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 179-180 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 160-161 (For availability see N74-29785 19-15)
CSCL 20K

The method of automatic identification of acoustical signals, by means of the segmentation was used to investigate noises and vibrations in machines and mechanisms, for cybernetic diagnostics. The structural analysis consists of presentation of a noise or vibroacoustical signal as a sequence of segments, determined by the time quantization, in which each segment is characterized by specific spectral characteristics. The structural spectrum is plotted as a histogram of the segments, also as a relation of the probability density of appearance of a segment to the segment type. It is assumed that the conditions of ergodic processes are maintained. Author

N74-29839* Kanner (Leo) Associates, Redwood City, Calif.
SELECTION OF INFORMATIVE PARAMETERS OF VIBROACOUSTIC PROCESSES c19
L. N. Koshek *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 181-184 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 162-164 (For availability see N74-29785 19-15)
CSCL 12A

The problem of selecting informative parameters of vibro-acoustic processes and the construction of apparatus for their determination are discussed. It is assumed that the processes being investigated are structurally uniform and either purely random or contain not very many determinative components. Author

N74-29840* Kanner (Leo) Associates, Redwood City, Calif.
DIGITAL METHODS OF EXTRACTING SPECTRAL CHARACTERISTICS IN A TRANSIENT SIGNAL c19
V. K. Maslov and G. A. Rozenberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 185-187 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 165-167 (For availability see N74-29785 19-15)
CSCL 12A

The use of algorithms for digital spectral analysis to study transient random signals of the X(t) = A(t) x N(t) type is discussed. Author

N74-29841* Kanner (Leo) Associates, Redwood City, Calif.
VIBRATIONAL SENSITIVITY OF A MEASURING INSTRUMENT AND METHODS OF INCREASING THE ACCURACY OF ITS DETERMINATIONS c14
Yu. S. Mironov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 188-189 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 168 (For availability see N74-29785 19-15)
CSCL 14B

The properties and peculiarities of two groups of measuring systems reacting to vibrations are discussed. Specifically, results of the action of a three dimensional, cophasal, monoharmonic vibration on the linear system of a measuring instrument was analyzed. Data are also given on the connection between vibration sensitivity and vibration resistance for instruments, methods for estimating vibration resistance, and formulas for expressing test results of vibration resistance. Experimental data are also given for decreasing errors in nonlinear systems during vibrations. Author

N74-29842* Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF THE VIBRATION OF STRUCTURES WITH A THREE-COMPONENT VIBRATION SENSOR c14
V. V. Yeskov, V. S. Konevalov, and A. S. Nikiforov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 190-192 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 169-171 (For availability see N74-29785 19-15)
CSCL 14B

The effects of transverse waves and longitudinal displacements on transverse displacements in a plate are studied using a three component vibration sensor. Limitations of using the sensor in such measurements are: (1) sensor connection to the plate leads to changes in transverse displacement points on the plate surface, (2) the sensor has a finite magnitude of selectivity with respect to vibrations in the direction of the different channel axes, (3) longitudinal displacements of plate surface create restrictions on relative sensitivity of sensor to longitudinal-transverse waves, and (4) tranverse displacement of plate surface during longitudinal wave propagation also creates a restriction on sensor sensitivity to transverse waves. Author

N74-29843* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF ACCOUNTING FOR INSTRUMENTAL DISTORTIONS DURING OBSERVATION OF SIGNALS c14
K. A. Kazlauskas and Ts. Ts. Paulauskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 193-194 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 172 (For availability see N74-29785 19-15)
CSCL 14B

A method is proposed for accounting for instrumental distortions in linear systems with known dynamic characteristics. Author

N74-29844* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF INVESTIGATION OF VIBROACOUSTIC CHARACTERISTICS OF CENTRIFUGAL PUMPS
B. V. Pokrovskiy, V. Ya. Rubinov, and A. M. Yurgin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 195-196 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 173-174 (For availability see N74-29785 19-15)
CSCL 13K

A method for acoustical diagnostics of pumps is described which consists of taking sonograms of the pump, by means of an audio spectrograph. In distinction from usual analyzers, the spectrograph makes it possible to obtain a three-dimensional image of the signal being analyzed, in which its frequency-amplitude characteristics developed over time are depicted with a resolving power of 0.004 sec. As an example, a sonogram of an electrically driven pump, in the 40-4000 Hz frequency range, is presented. The amplitude ratios are determined on the sonogram by the contrast of individual contours, with an accuracy of 6 db. Author

N74-29845* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF APPROXIMATE DETERMINATION OF THE CHARACTERISTICS OF NONLINEAR VIBRATIONAL SYSTEMS c19
R. P. Atstupenene and V.-R. V. Atstupenas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 197-203 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostik Mekhanicheskikh Sistem po Vibroakustichieskim Protsessam" Kaunas, KPI Press, 1972 p 175-179 (For availability see N74-29785 19-15)
CSCL 12A

Methods are discussed for determining the characteristics of elements of nonlinear vibrational systems, from the results of analyzing forced vibrations which are approximate in themselves, since they are based on the use of experimental data. The constant components of the linearized characteristics and linearization

coefficients are determined experimentally by finding the values of these quantities at different vibration amplitudes and frequencies and subsequent approximation of their analytical expressions. Simple and convenient, although approximate, formulas for determining the characteristics of vibrational systems from experimentally known functions are derived. Author

N74-29846* Kanner (Leo) Associates, Redwood City, Calif.
THE RELATIONSHIP OF TRANSIENT VIBRATIONAL PROCESSES AT A POINT IN A PLATE TO THE NATURE OF SUDDEN KINEMATIC DISTURBANCES c32
Yu. K. Konenkov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 204-207 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 180-182 (For availability see N74-29785 19-15)
CSCL 20K

A solution is given to the problem of a transient vibration process in a fastened plate, during a sudden displacement of the edge. Some partial cases of excitation are examined in which the packing can be calculated and the explicit type of change in a deformation over time can be found. Some examples are presented. Author

N74-29847* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF VIBRATION DAMPERS
V. A. Kamayev and S. V. Nikitin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 209-211 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 184-186 (For availability see N74-29785 19-15)
CSCL 13I

A method which uses a mathematical accelerometer is proposed for determining the 3rd derivative of the displacement in shock absorbers. Author

N74-29848* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF A SYSTEM WITH ACTIVE VIBRATION ISOLATION, CONSIDERING THE VIBROACOUSTICAL CHARACTERISTICS OF THE SOURCE AND OF THE ISOLATED OBJECT c09
M. D. Genkin, V. G. Yelezov, and V. V. Yablonskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 212-215 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 187-189 (For availability see N74-29785 19-15)
CSCL 09E

The efficiency and resistance of an active vibration isolation system (AVI) are analyzed for the case of unidirectional vibrations of a mass on a spring, with a damper, resting on a rigid base. The effect of certain vibroacoustical characteristics of real objects on AVI resistance and synthesis of AVI, which are effective over a wide frequency band are considered. A numerical analysis of the response of a mechanical system with AVI features is presented. Author

N74-29849* Kanner (Leo) Associates, Redwood City, Calif.
ACTIVE DAMPING OF UNIDIMENSIONAL STRUCTURES c32
B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 216-221 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 190-195 (For availability see N74-29785 19-15)
CSCL 20K

The vibration characteristics of an unidimensional structure are discussed. The cases considered are: (1) a rigid pipe in which a wave propagates, (2) an infinite string along which a transverse wave propagates, (3) a rod along which longitudinal or torsional columns propagate, and (4) generally a unidimensional propagation of some one mode of vibrations which is nondegenerating with distance. Mathematical models are developed to show the performance of the mechanical devices under various damping conditions. Author

N74-29850* Kanner (Leo) Associates, Redwood City, Calif.
COMPENSATION OF VIBRATIONS OF A UNIDIMENSIONAL STRUCTURE AND A PLANE ACOUSTICAL FIELD c32
B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 222-228 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 197-201 (For availability see N74-29785 19-15)
CSCL 20K

Endless structures are realized in practice, in the presence of loss and to an adequate extent, owing to which, reflections from the edges to the center part of the structure can be disregarded. In the absence of losses, reflections from the boundary frequently have to be taken into account. In this case, besides compensation for waves passing through the boundary, the reciprocal connection system can be used for compensation of the total field ahead of the boundary. In these cases, the system converters can be located in a different manner relative to the boundary and to one another. Each of the locations has inherent peculiarities, which must be taken into account in solving specific problems. Author

N74-29851* Kanner (Leo) Associates, Redwood City, Calif.
A NEW METHOD OF MEASUREMENT OF TENSION ON A MOVING MAGNETIC TAPE c14
A. K. Kurtinaytis and Ye. S. Lauzhinskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 229-231 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 202-204 (For availability see N74-29785 19-15)
CSCL 14B

The possibility of no-contact measurement of the tension on a moving magnetic tape, assuming the tape is uniform, is discussed. A scheme for calculation of the natural frequency of transverse vibrations of magnetic tape is shown. Mathematical models are developed to show the relationships of the parameters. The method is applicable to the analysis of accurate tape feed mechanisms design. Author

N74-29852* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRICAL AND ACOUSTICAL RESONANCES OF VIBRATORS c14
M. V. Khvingiya, T. G. Tatishvili, and A. G. Zilberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 235-238 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 207-211 (For availability see N74-29785 19-15)
CSCL 14B

The basic sources of vibration in electrical machines are identified as: (1) unbalanced masses of the rotor, (2) condition of the bearings, and (3) the electromagnetic field gap. Methods for improving the vibration characteristics of electrical machines are proposed. A mathematical model is developed for calculating the damping elements located between the bearings and the mounts. Author

N74-29853* Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS OF VIBROACOUSTICAL DIAGNOSTICS OF TEXTILE MACHINES
L. N. Ivanov, O. N. Pobol, and G. T. Gevorkyan *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 239-240 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 212-213 (For availability see N74-29785 19-15)
CSCL 13I

The application of a vibroacoustical method for analyzing the vibration characteristics of textile machines is discussed. A drawing of a typical mechanism is provided to show the sources of vibration. The conditions under which the machine operates are defined. An accelerometer is used as a sensor. The point of

installation is selected so that a dip in the frequency characteristic of the vibrating part, on which the sensor is installed, in the region of the maximum acoustical signal. This allows for a drop in the vibrations for those values of the gap in the mechanism which amount to 10 to 20 db. Author

N74-29854* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTIC DEVICE FOR MONITORING THE TECHNICAL CONDITION OF MECHANICAL ASSEMBLIES
V. I. Osovskiy, V. V. Shergin, and V. I. Shumilin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 241-242 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 214 (For availability see N74-29785 19-15)
CSCL 13I

An automatic diagnostic device for monitoring the condition of tractor transmission gears is described. The structural noise spectrum of the gearshift box and rear axle of the tractor were analyzed in a digital computer, by an algorithm based on the multiple correlation method. The optimum assembly of operating frequencies, by use of which the errors in measurement were minimized, was selected from the entire frequency spectrum. Selected frequencies are necessary for choosing the measurement range of the diagnostic device. It turned out that, to obtain a relative error of no more than 2%, it was sufficient to use two filters, vibrating only at the frequencies carrying the maximum data of the mechanical parameter being investigated. The measurement system consists of frequency-selection filters, amplifiers and quadratic detectors, at the outlets of which constant voltages are created, which are proportional to the signal level at the frequencies selected. Author

N74-29855* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF THE RELATIONSHIP BETWEEN ERRORS IN MANUFACTURE OF SLOT CONNECTIONS AND GEAR DRIVE NOISES
M. K. Bodronosov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 245-246 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 217-219 (For availability see N74-29785 19-15)
CSCL 13I

On the basis of experimental research, an analysis was carried out of the effect of certain errors in manufacture of straight-barrel slots on the noise characteristics of gear drives. In carrying out the experiments, the gear crowns of the test wheels were held immovable, and only the geometric dimensions of the slots and the mutual locations of the individual elements were varied. The investigation of the effect of each factor was carried out under otherwise equal conditions, on 34:56 cog ratio gear pairs (m = 2mm), made of 40 C steel, with a gear crown accuracy of 7 X, machining fineness 7, at a speed v = 7.1 m/sec. The number of slots was 6. The clearance in slot pairs in dimension D, equal to 0.015, 0.05, 0.08 and 0.110 mm, was obtained by change in the outer diameter of the spindle by means of polishing. The results of the tests of the experimental wheels showed that their noise level increases with increase in clearance. Author

N74-29856* Kanner (Leo) Associates, Redwood City, Calif.
THE PROBLEM OF CARRYING OUT A DIAGNOSIS OF AN INTERNAL COMBUSTION ENGINE BY VIBROACOUSTICAL PARAMETERS **c28**
V. N. Lukanin and V. I. Sidorov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 247-249 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 219-221 (For availability see N74-29785 19-15)
CSCL 21A

The physics of noise formation in an internal combustion engine is discussed. A dependence of the acoustical radiation on the engine operating process, its construction, and operational parameters, as well as on the degree of wear on its parts, has been established. An example of tests conducted on an internal combustion engine is provided. A system for cybernetic diagnostics for internal combustion engines by vibroacoustical parameters is diagrammed. Author

N74-29857* Kanner (Leo) Associates, Redwood City, Calif.
TRANSITIONAL MODES OF MOTION AND CAPTURE REGIONS OF VIBROSHOCK SYSTEMS **c32**
V. L. Ragulskene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 250-255 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 222-228 (For availability see N74-29785 19-15)
CSCL 20K

A numerical analysis of the transitional modes of motion for a vibroshock system was conducted. The capture regions of the system are emphasized. The three initial parameters for a nonautonomous vibroshock system with one degree of freedom are identified as: (1) coordinates, (2) velocity, and (3) time. Mathematical models are developed to show the relationship of the parameters. Graphs are included to show the nature of the capture regions and to portray the trajectory of motion of mass with time, by solution of differential equations during increase and decrease in time. Author

N74-29858* Kanner (Leo) Associates, Redwood City, Calif.
CERTAIN CHARACTERISTICS AND CAPTURE REGIONS OF NONLINEAR VIBRATING SYSTEMS **c32**
V. L. Ragulskene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 256-259 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 229-231 (For availability see N74-29785 19-15)
CSCL 20K

Free vibrations of a system and vibrations which are multiples of them in frequency are discussed. The corresponding periodic forced vibrations of the type n/m (n is the number of periods of disturbance between periods of movement and m is the number of periods of movement in one period of disturbance), generated by a harmonic or close to harmonic disturbance, are propagated close to the corresponding curves of the free vibrations and their frequency multiples. It has been proposed that investigation of transitional modes of motion and capture regions be carried out by precise methods in phase space, with the least number of coordinates. Thus, for example, for nonautonomous second order equations (for example, the Duffing equations), in place of three variables (coordinates, velocity, phases), it is proposed to use two: velocity during transition of the coordinate through zero and phase. Author

N74-29859* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRONIC DAMPING OF MECHANICAL VIBRATIONS **c10**
P. Vasilyev and A. Navitskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 260-263 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 231-235 (For availability see N74-29785 19-15)
CSCL 09C

The conditions required for measuring and recording the patterns of vibration of a process are discussed. It is stated that the frequency of the process being investigated must be an order of magnitude lower than the natural frequency of the sensitive receiving element for sufficient accuracy. The elastic element must damp so the frequency range of the vibrational patterns being investigated can be expanded. This is especially true of the tensile stresses of a moving signal carrier. A method is proposed for damping mechanical vibrations of elastic sensitive elements with semiconductor strain gages, based on electronic compensation of the natural vibrations. A schematic diagram is provided to show the conditions. Author

N74-29860* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF MECHANISMS WITH FLEXIBLE CENTRIFUGAL-INERTIAL CONNECTIONS ACCORDING TO FIXED DYNAMIC CHARACTERISTICS
K. M. Ragulskis and I. K. Yaroslavskiy *In its* Cybernetic Diagnostics

of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 264-268 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 235-240 (For availability see N74-29785 19-15)
CSCL 13I

The criteria for the selection of dynamic characteristics of flexible centrifugal-inertial couplings are discussed. The basic properties considered are: (1) vibration isolation, (2) vibration quenching, and (3) transmission properties. It is stated that the most promising couplings are those with a nonlinear relation between the magnitude of the torque transmitted and the magnitude of deformation of the coupling. The efforts of various investigators are briefly analyzed. Mathematical models are developed to show the relationships of the parameters involved.
Author

N74-29861* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF VIBRATION SYSTEMS, HAVING GROUP SYMMETRY OR QUASI-SYMMETRY, ACCORDING TO THE FREQUENCY SPECTRUM
A. I. Andryushkevichyus and K. M. Ragulskis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 269-270 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 240-242 (For availability see N74-29785 19-15)
CSCL 13I

Torsional vibration systems, with finite numbers of degrees of freedom are investigated. In designing such systems, it is important to select parameters, so that the frequency spectrum of the natural vibrations is beyond the limits of the resonance danger region. In the case when the system has a large number of degrees of freedom, calculation of its natural frequencies, as well as tuning out the resonance danger zones is laborious. When the system being investigated has one group symmetry or another, solution of the problem mentioned above is facilitated, as a consequence of breaking down the frequency equations into several, which are smaller in size. An algorithm is given for tuning out the natural frequency spectrum from the forbidden region, by means of varying the rigidity of systems having group symmetries or group quasi-symmetries.
Author

N74-29862* Kanner (Leo) Associates, Redwood City, Calif.
VIBRATION RESISTANCE OF THE WIRE-FEED MECHANISM OF A MAGNETIC RECORDING APPARATUS c07
S. P. Kitra and R.-T. A. Tolochka *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 271-274 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 243-245 (For availability see N74-29785 19-15)
CSCL 14C

The effects of external mechanical and climatic actions on the efficient operation of magnetic tape recording equipment are analyzed. The efficiency and reliability of the recording system are determined by the structural parameters and the characteristics of the individual elements of the transport mechanism circuit. The resistance of tape recording equipment to the effects of vibration is considered essential for reliable operations. Methods for insuring reliable tape transport and recording action are discussed.
Author

N74-29863* Kanner (Leo) Associates, Redwood City, Calif.
SPECTRAL COMPOSITION OF A MEASURING SIGNAL DURING MEASUREMENTS OF VIBRATION RATES OF A MOVING BODY c32
I.-A. I. Daynauskas and N. N. Slepov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 275-278 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 246-249 (For availability see N74-29785 19-15)
CSCL 20K

Cybernetics diagnostics of machines and mechanisms using the spectral approach is discussed. The problem of establishing the accuracy of determination of the spectral composition is investigated. In systems with rectilinear or rotary movement, the vibrations appear in the form of movement rate vibrations, which are equivalent to frequency modulation of the signal, in proportion to the mean movement rate of the body. The case of a harmonic signal which reproduces and analyzes the characteristics of the frequency modulated signal is discussed. Mathematical models are developed to show the relationships of the parameters.
Author

N74-29864* Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF IRREGULARITIES IN ANGULAR VELOCITIES OF ROTATING ASSEMBLIES IN MEMORY DEVICES ON MAGNETIC CARRIERS c07
G. I. Virakas, R. A. Matsyulevichyus, K. P. Minkevichyus, Z. I. Potsyus, and B. D. Shirvinskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 279-282 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 250-253 (For availability see N74-29785 19-15)
CSCL 14C

Problems in measurement of irregularities in angular velocity of rotating assemblies in memory devices with rigid and flexible magnetic data carriers are discussed. A device and method for determination of change in angular velocities in various frequency and rotation rate ranges are examined. A schematic diagram of a photoelectric sensor for recording the signal pulses is provided. Mathematical models are developed to show the amount of error which can result from misalignment of the test equipment.
Author

N74-29865* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF FLUCTUATIONS IN ANGULAR VELOCITY IN MAGNETIC MEMORY DEVICES c08
Yu. A. Meshkis and Z. Yu. Potsyus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 283-284 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 254 (For availability see N74-29785 19-15)
CSCL 09B

The fluctuations in the angular velocity of individual assemblies of a precision mechanical system were analyzed. The system was composed of an electric motor and a magnetic drum which were connected by a flexible coupling. A dynamic model was constructed which took into account the absence of torsion in the rigid shafts of the electric motor drive rotor and the magnetic drum. The motion was described by Lagrange differential equations of the second kind. Curves are developed to show the nature of amplitude fluctuation of the magnetic drum angular velocity at a specific excitation frequency. Additional curves show the amplitudes of fluctuation of the magnetic drum angular velocity compared to the quantity of damping at specific frequencies.
Author

N74-29866* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATION CHARACTERISTICS OF ELECTRIC MOTORS c09
A. K. Bakshis and Yu. K. Tamoshyunas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 285-288 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 255-259 (For availability see N74-29785 19-15)
CSCL 09E

The vibration characteristics of electric motors were analyzed using mathematical statistics methods. The equipment used and the method of conducting the test are described. Curves are developed to show the visualization of the electric motor vibrations in the vertical direction. Additional curves are included to show the amplitude-phase frequency characteristic of dynamic rotor-housing vibrations at the first lug and the same data for the second lug of the electric motor. Mathematical models were created to show the transmission function of the dynamic rotor housing system.
Author

N74-29867* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL RESEARCH ON AEROSTATIC SUSPENSIONS c14

L. A. Bushma *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 289-291 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protosessam" Kaunas, KPI Press, 1972 p 260-262 (For availability see N74-29785 19-15)
CSCL 14B

Suspensions for carrying out experimental investigations, for the purpose of studying a number of problems in dynamics and stability of a suspended cylindrical body at various dynamic loads were investigated in the work. The results of the experimental investigations served as a basis for building a stand with a variable resonator. The experimental stand for suspension of cylindrical object, with a comparatively high natural free vibration frequency in the vertical direction, coinciding with the axis of the suspended object, is distinguished by the possibility of regulating the size of the clearance and is intended for carrying out preliminary experimental studies, for the purpose of selection of optimum aerostatic suspension parameters. Author

N74-29868* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF A CORRECTING FILTER WITH PHASE STABILIZATION OF THE ANGULAR VELOCITY OF A SYNCHRONOUS MOTOR BY THE FEEDBACK SYSTEM METHOD c09
K. A. Kazlauskas and A. I. Kurlavichus *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 292-293 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 263 (For availability see N74-29785 19-15)
CSCL 09E

The operating characteristics of a synchronous electric motor are discussed. A system of phase stabilization of the instantaneous angular velocity of rotation of a synchronous-reaction motor is diagrammed. A mathematical model is developed to show the parameters which affect the operation of the motor. The selection of a correcting filter to use with the motor in order to reduce the reaction of the system to interference is explained. Author

N74-29869* Kanner (Leo) Associates, Redwood City, Calif.
STUDIES OF IRREGULARITIES IN MOTION OF VIBRO-SHOCK TYPE MECHANISMS
S. Yu. Mateyshka *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 294-295 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 264-265 (For availability see N74-29785 19-15)
CSCL 13I

Reciprocating motion mechanisms, in which a mass with large gaps can be driven with almost uniform speed, are investigated. A single-mass system with dry friction, the motion of which is restricted by two stops, is examined. The system is put into motion by kinematic disturbances through a flexible link. Periodic modes of movement, under conditions in which the disturbance arises from two impacts on the mass (from the right and left stops) are examined. Primary attention was given to irregularities in the course of the mass. The shock interaction of the mass with the stop was accounted for by the shock speed restoration coefficient R. The shock-frequency characteristics of the free shock vibrations were determined. Expressions were obtained which define the transitional process. The phase and velocity of several succeeding shocks were determined. After taking account of the conditions of the steady mode of movement, velocities and phases in the steady mode of movement were obtained. Author

N74-29870* Kanner (Leo) Associates, Redwood City, Calif.
STATISTICAL DETERMINATION OF THE ACCURACY OF RECORDING OF A HIGH-SPEED ELECTROSTATIC RECORDER c07
A.-A. P. Laurutis and V. P. Laurutis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 296-299 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 266-269 (For availability see N74-29785 19-15)
CSCL 14C

The operating characteristics of an electron beam, electrostatic recorder are discussed. The data recording accuracy of the equipment under conditions producing vibrations in the data carrier and which affect the mechanical scanning precision are analyzed. In particular, fluctuations in the linear velocity of the data carrier while recording cause a change in the time scale, according to the fluctuation pattern. Because of the random nature of the fluctuations, a statistical method is used for numerical analysis. Author

N74-29871* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF THE DYNAMICS AND FREQUENCY SPECTRUM SYNTHESIS OF AN OPTICAL-MECHANICAL SCANNING DEVICE c14
A. I. Andryushkyavichyus, A. L. Kumpikas, and K. L. Kumpikas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 301-305 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 271-273 (For availability see N74-29785 19-15)
CSCL 14B

A two-coordinate optical-mechanical scanning device (OMSD), the operating unit of which is a scanning disk, with directional and focusing optics and a board, on which the data carrier is placed, is examined. The disk and board are kinematically connected by a transmission mechanism, consisting of a worm and complex gear drive and a tightening screw-nut with correcting device, and it is run by a synchronous type motor. The dynamic errors in the system depend, first, on irregularities in rotation of the disk, fluctuations in its axis and vibrations of the table in the plane parallel to the plane of the disk. The basic sources of the fluctuations referred to above are residual disbalance of the rotor and other rotating masses, the periodic component of the driving torque of the synchronous motor, variability in the resistance, kinematic errors in the drive and other things. The fluctuations can be transmitted to the operating units through the kinematic link as a flexural-torsional system, as well as through vibrations of the housing of the device. Author

N74-29872* Kanner (Leo) Associates, Redwood City, Calif.
RESEARCH ON DECREASING THE NOISE OF A JET c12
M. E. Akelis, L. P. Bastite, and V. K. Naynis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 308-310 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 276-277 (For availability see N74-29785 19-15)
CSCL 20D

An investigation was conducted to determine the amount of noise reduction that could be obtained by communicating the axial vibrations of the nozzle of a jet engine to the suspension mechanism. Mathematical models were developed to establish the relationship of the parameters. The pressure pulsations in the jet were recorded by measuring microphones and the data were processed by statistical dynamics methods. It was determined that the jet noise spectrum was successfully changed with various mechanical suspension impedances. Author

N74-29873* Kanner (Leo) Associates, Redwood City, Calif.
NEW METHODS OF FRAGMENTARY APPROXIMATION OF A FUNCTION c19
S. G. Kolesnichenko and A. A. Maslov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 311-313 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 278-279 (For availability see N74-29785 19-15)
CSCL 12A

Certain special methods of fragmentary approximation of a function are examined and the properties of the most widespread elementary functions for such approximation methods are investigated, for the purpose of developing useful characteristics and properties for practical realization, in particular, for their reproduction by analog functional converters, with a significantly

smaller number of controlable or adjustable parameters than in known ones. Author

N74-29874* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF A VIBRATION-DAMPING UNIT FOR REDUCTION IN LOW-FREQUENCY VIBRATIONS OF ELECTRIC MOTORS c09
N. V. Grigoryev and M. A. Fedorovich *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 314-316 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 280-283 (For availability see N74-29785 19-15)
CSCL 09E

The vibroacoustical characteristics of different types of electric motors are discussed. It is shown that the basic source of low frequency vibrations is rotor unbalance. A flexible damping support, with an antivibrator, is used to obtain the vibroacoustical effect of reduction in the basic harmonic of the electric motor. A model of the electric motor and the damping apparatus is presented. Mathematical models are developed to show the relationships of the parameters. The basic purpose in using a calculation model id the simultaneous replacement of the exciting force created by the rotor unbalance and its inertial rigidity characteristics by a limiting kinematic disturbance. Author

N74-29875* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE POSSIBILITY OF USE OF VIBROACOUSTICAL SIGNALS FOR PURPOSES OF DIAGNOSTICS IN AERONAUTICAL ENGINEERING c28
A. R. Press *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 317-319 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 284-285 (For availability see N74-29785 19-15)
CSCL 21A

The application of vibroacoustic techniques for diagnosing aircraft engine malfunctions is discussed. An experiment was conducted to determine the defects introduced by the nature of change in the amplitude-frequency characteristics of the noises and vibrations of an aircraft jet engine. The manner in which the defects were simulated is explained. The test equipment used during the experiment is identified. The results of the amplitude-frequency characteristics investigation are summarized to show optimum location of the microphone pick-up to record the acoustic data. Author

N74-29876*# Michigan Univ., Ann Arbor. Systems Engineering Lab.
THEORY OF RELIABLE SYSTEMS Semiannual Status Report, 1 Jan. - 30 Jun. 1974
John F. Meyer Jul. 1974 47 p refs
(Grant NGR-23-005-622)
(NASA-CR-139379) Avail: NTIS HC $5.50 CSCL 14D

Research is reported in the program to refine the current notion of system reliability by identifying and investigating attributes of a system which are important to reliability considerations, and to develop techniques which facilitate analysis of system reliability. Reliability analysis, and on-line fault diagnosis are discussed. F.O.S.

N74-29877# Technische Universitaet, Brunswick (West Germany).
STUDIES ON ELASTOHYDRODYNAMIC LUBRICATING FILM THICKNESS FOR ELLIPTICAL HERTZ SURFACE CONTACTS Ph.D. Thesis [UNTERSUCHUNGEN UEBER DIE ELASTOHYDRODYNAMISCHE SCHMIERFILMDICKE BEI ELLIPTISCHEN HERTZSCHEN KONTAKTFLAECHEN]
Peter Brueser 1972 146 p refs In GERMAN
Avail: NTIS HC $10.50

A numerical method is developed for calculating the elastohydrodynamic pressure in the lubricating film thickness between elliptical Hertz contact surfaces with emphasis on the lubrication gap. Considered are pressure dependence on oil viscosity and density in forming the hydrodynamic equations; two different iteration procedures solve the problems for the feeding zone for the actual Hertz region. Transl. by G.G.

N74-29878# Technischen Universitaet, Hanover (West Germany).
MASSIVE COLD FORMING OF HEAVY METAL PLATE PARTS Ph.D. Thesis [KALT - MASSIVUMFORMEN VON GROBBLECHTEILEN]
Manfred Rick 1972 170 p refs In GERMAN
Avail: NTIS HC $11.50

Various mechanical techniques are outlined for the cold forming of flat workpieces from plate metal. Considered are frontal forming, compression cutting, extrusion molding, drawing, pressing, etc., as well as several combinational methods. Transl. by G.G.

N74-29879# Technischen Universitaet, Hanover (West Germany).
BEHAVIOR AND EFFECTIVENESS OF LUBRICANTS IN DROP FORGING OF STEEL Ph.D. Thesis [VERHALTEN UND WIRKUNGSWEISE VON SCHMIERSTOFFEN BEIM GESENKSCHMIEDEN VON STAHL]
Eckart Schlomach 1973 152 p refs In GERMAN
Avail: NTIS HC $10.75

The effectiveness of lubricants in preventing friction and abrasion during steel forging depends on their composition and the application method. Lubricants are evaluated for their spray consistency and the ability to form uniform films on metal surfaces, their cooling and dispersion properties, and the effects of organic additives on those properties. Transl. by G.G.

N74-29880# Technischen Universitaet, Hanover (West Germany).
PROCEDURE FOR AUTOMATIC THREE DIMENSIONAL OBJECT MEASUREMENTS USING COORDINATE MEASURING MACHINES Ph.D. Thesis [VERFAHREN ZUR AUTOMATISCHEN RAEUMLICHEN OBJEKTVERMESSUNG MIT KOORDINATEN-MESSMASCHINEN]
Uwe Vaihinger 1973 82 p refs In GERMAN
Avail: NTIS HC $7.25

The automation of a three dimensional coordination measuring machine requires a measuring sensor with computerized guidance control during scanning of tool surface geometries. The measuring sensor has to be independent from the measurement direction. Transl. by G.G.

N74-29881# Technischen Universitaet, Hanover (West Germany).
PRODUCTION OF TUBULAR COUPLINGS FROM UNALLOYED STEEL AND ACID RESISTANT METALS BY HOT FORMING Ph.D. Thesis [BEITRAG ZUR FERTIGUNG ROHRFOERMIGER VERBUNDKOERPER AUS UNLEGIERTEM STAHL UND SAEUREBESTAENDIGEN METALLEN DURCH WARMUMFORMUNG]
Ivo Moeller 1972 245 p refs In GERMAN
Avail: NTIS HC $15.25

The effects of hot forming velocity, deformation temperature, boundary layer enlargement and heat treatment on the adhesion of corrosion resistant claddings on steel pipes are studied. Optical, mechanical, and microanalytical observations show that chromium- and chromium nickel-plated pipes possess good shearing resistance, but that titanium plated pipes exhibit little adhesive strength and bending properties. Transl. by G.G.

N74-29882# Technischen Universitaet, Hanover (West Germany).
MAGNETIC FIELD EFFECTS IN METAL-BUFFER GAS WELDING (A CONTRIBUTION TO THE BEHAVIOR OF ARCS, THE MATERIAL TRANSFER AND THE FUSION DIMENSION AND FORM IN BUFFER GAS WELDING DURING SUPERIMPOSITION OF LONGITUDINAL MAGNETIC FIELDS) Ph.D. Thesis [BEEINFLUSSUNG DER METALL-SCHUTZGASSCHWEISSUNG DURCH MAGNETFELDER (EIN BEITRAG ZUM VERHALTEN DES LICHTBOGENS, DES MATERIAL-UEBERGANGES SOWIE DER EINBRANDGROESSE UND-FORM FUER DIE SCHUTZGASSCHWEISSUNG BEI UEBERLAGERUNG LONGITUDINALER MAGNETFELDER)]
Heinz-Bodo Basler 1973 181 p refs In GERMAN
Avail: NTIS HC $12.25

Magnetically controlled arc welding with steel and aluminum wires produces a synchronous drop transfer, strong seams, and elimination of undesirable bubble formation. Semi-automatic and automatic gas welding methods are most suitable for control by magnetic fields. Transl. by G.G.

N74-29883*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMBINED EFFECTS OF HYDRAZINE EXPOSURE AND ENDURANCE TESTING ON SOLENOID-ACTUATED VALVE PERFORMANCE
Ray Hagler, Jr. 1 Jul. 1974 35 p refs
(Contract NAS7-100)
(NASA-CR-139360; JPL-TM-33-691) Avail: NTIS HC $4.75
CSCL 13K

Results are presented from a test program which was conducted to assess the capability of various solenoid-actuated valve design concepts to provide performance characteristics commensurate with long-duration (ten-year) missions to explore the outer planets. The valves were installed in a hydrazine flow test setup and periodically cycled during a nine-month test period under test conditions comparable to anticipated mission operating conditions. In situ valve performance was periodically determined, and leakage was continuously monitored. Author

N74-29884# Technischen Universitaet, Munich (West Germany).
STUDY ON THE DYNAMIC BEHAVIOR OF FEED DRIVES FOR NUMERICAL CONTROLLED TOOLING MACHINES WITH OPERATING CYLINDER FEEDS AND POSITIONING CONTROL Ph.D. Thesis [UNTERSUCHUNG DES DYNAMISCHEN VERHALTENS VON VORSCHUBANTRIEBEN FUER NUMERISCH GESTEUERTE WERKZEUGMASCHINEN MIT STELLZYLINDERANTRIEBEN UND LAGEREGELUNG]
Andreas Laika 27 Jul. 1973 154 p refs In GERMAN
Avail: NTIS HC $10.75

Cylindrical drives are used as servomotors in digital controlled tooling machines with positioning feed drive. The dynamic properties of these automatic positioning devices are reported and corrective control measures for increased accuracy are outlined. Optimal parameterization is achieved by introducing correcting devices in the form of parallel branches or series control members. Transl. by G.G.

N74-29885*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEEDINGS OF THE THIRD SPACE PROCESSING SYMPOSIUM ON SKYLAB RESULTS, VOLUME 1
Jun. 1974 528 p refs Symp. held at Huntsville, Ala., 30 Apr. - 1 May 1974
(NASA-TM-X-70252; M-74-5-Vol-1) Avail: NTIS HC $29.50
CSCL 13H

Results of materials processing experiments conducted on NASA's Skylab flights are presented and several related research activities for materials processing in space beyond Skylab are discussed. For individual titles, see N74-29886 through N74-29904.

N74-29886* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTRODUCTION TO SPACE PROCESSING
M. P. L. Siebel *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 3-31 refs (For availability see N74-29885 19-15)
CSCL 13H

The conference was organized to present results of Skylab and other experiments, and to show opportunities for building on the existing basis of experience for profitable exploitation of the space environment. Briefly discussed are: (1) low g test capabilities; (2) materials; (3) process elements; (4) processing systems; and (5) Skylab experiment facility and modules. A.L.

N74-29887* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENT M552 EXOTHERMIC BRAZING
J. R. Williams *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 33-84 refs (For availability see N74-29885 19-15)
CSCL 13H

The M552 Skylab experiment reveals that brazing in space is feasible. It successfully demonstrated the ability to retain molten metal within a braze tube joint system. Surface energy was the dominant operative force system controlling liquid metal for this experiment. The zero gravity environment for brazing resulted in several differences; increased solubility, increased liquid spreading, more uniform menisci (liquid/vapor interface) and a reduction of braze alloy shrinkage defects. The residual radioactive intensity and location of the redistributed isotope was interpreted to provide a sequential history of braze alloy movement during the melt-flow-solidification stages of the process. Convection theory applied to M552 was validated but some results were not explainable by it, i.e., increased nickel transport and the radial mixing of the silver isotope on samples SLN-2 and SLN-4. All characteristics of thermal analysis appeared to react as expected but heat conduction rates increased because of increased extent, rate and uniformity of braze alloy spreading. Author

N74-29888* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB M551 METALS MELTING EXPERIMENT
E. C. McKannan and R. M. Poorman *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 85-100 refs (For availability see N74-29885 19-15)
CSCL 11D

The M551 Metals Melting Experiment was to: (1) study behavior of molten metal; (2) characterize metals melted and solidified in the low gravity space environment compared to one-gravity of earth; and (3) determine feasibility of joining metals in space. The experiment used the electron beam (EB) and chamber of the M512 apparatus to make a dwell puddle and a melt in a rotating disc of varying thickness. The three disc materials were aluminum 2219-T87, 304 stainless steel and pure tantalum to provide a wide range of density and melting conditions. Observations include the proof that EB welding, cutting and melting can be done successfully in low gravity. Earlier, some welding authorities had postulated that without gravity the EB would force the molten puddle out of contact. From the view-point of cast-solidification, small, equiaxed grains in Skylab specimens compared to large, elongated grains in ground-based specimens were observed. The former are thought to be associated with constitutional supercooling and nucleation where the latter are associated with dendritic solidification. In further support of the more equiaxed grain growth in Skylab, symmetric subgrain patterns were frequently observed where there was much less symmetry in ground-based specimens. Author

N74-29889* Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
SKYLAB M553 SPHERE FORMING EXPERIMENT
D. J. Larson *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 101-113 refs (For availability see N74-29885 19-15)
(Contract NAS8-28728)
CSCL 13H

The experiment was designed to study the effects of weightlessness in solidification processes. Four face centered cubic materials of varying alloy contents and solidification reaction types were studied. Careful analysis of the samples indicated that there was an outstanding record of both initial and terminal solute redistribution processes, and that this record may be substantially better than that obtained terrestrially for comparable experimental conditions. Further, the last regions to solidify evidence extensive solidification terracing; and for one alloy type, this terracing was found to be decorated with second phase precipitate particles. These particles were highly localized in systematic arrays which were frequently low index crystallographic systems. Some of the samples underwent unanticipated solidification reactions rather than the anticipated solid/liquid processes. Subsequent consideration indicated that this phenomenon could have been anticipated and that it was a result of the reduced gravity environment. Author

N74-29890* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EXPERIMENT M479 ZERO GRAVITY FLAMMABILITY **c33**
J. H. Kimzey *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 115-130 ref (For availability see N74-29885 19-15)
CSCL 21B

Flammability under conditions of weightlessness was investigated in Skylab 4. Thirty-seven tests using six materials were successfully carried out to learn more about how a flame acts in the absence of convection. Specific objectives were to

note the extent of surface flame propagation and flash-over to adjacent materials, rates of surface and bulk flame propagation, self-extinguishment, and extinguishment by both vacuum and water spray. All tests were performed and all hardware functioned properly, although an operational oversight caused the water in the supply tank to be less than the minimum required pressure. Burning rates were significantly reduced as anticipated from earlier aircraft tests. Some reduction of total burning was also noted. The surface burn was not followed by continued inward burning as typically experienced on earth although some one-g tests at extremely low pressures have partially reproduced this condition. Ignition and extinguishment also appear to be similar to one-g. Smoke patterns were also noted. This can be of value in studying Brownian movement of solids in gases under conditions of weightlessness. Author

N74-29891* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTRODUCTORY REMARK TO M-518 MULTIPURPOSE FURNACE EXPERIMENTS PERFORMED ON SKYLAB c14
William R. Adams *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 131-132 (For availability see N74-29885 19-15)
CSCL 14B

The design, operation, and function of the M518 Multipurpose Furnace System are briefly described. A.L.

N74-29892* TRW Systems Group, Redondo Beach, Calif.
EXPERIMENT NO. M-577 IMMISCIBLE ALLOY COMPOSITIONS c17
J. L. Reger *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 133-158 refs (For availability see N74-29885 19-15)
CSCL 11F

Ampoules containing materials exhibiting either liquid or solid state immiscibility were thermally processed in the M-518 Multipurpose Electric Furnace under low and one gravity conditions. Three cartridges, each containing three separate experiment ampoules were processed simultaneously during one furnace run. Two of the experiment ampoules, gold-germanium (Ampoule A) and lead-zinc-antimony (Ampoule B), were processed in the isothermal portion of the furnace and one experimental ampoule, lead-tin-indium (Ampoule C), was processed in the gradient region of the furnace. Both the control (one gravity) and low gravity processed specimens were analyzed for their metallographic and electronic properties. In all cases, the low gravity processed specimens exhibited better homogenization and microstructural appearances than the one gravity control specimens. From these analyses, it is concluded that low gravity processing of materials processing liquid or solid immiscibility can produce compositions exhibiting unusual metallographic and electronic behavior. Author

N74-29893* Universite Catholique de Louvain (Belgium).
SILVER SAMPLES MELTED IN SPACE SKYLAB EXPERIMENT M565 c17
A. Deruyttere, E. Aeronoudt, H. Goeminne, J. Smeesters, O. Arkens, and M. Verhaeghen *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 159-202 refs (For availability see N74-29885 19-15)
CSCL 11F

This experiment was to make a preliminary study of the behaviour of porous material when melted and resolidified in weightless condition. Two kinds of samples were used: perforated discs and a fibre compact. The observations made on the various specimens are presented and compared with those made on similar specimens treated in the same manner on the ground. Some provisional conclusions are: (1) Most of the original porosity in the samples has disappeared during the melting stage. (2) Even if samples were perfectly spherical in the liquid state, their shape is altered on solidification due to both shrinkage pipe formation and constitutional supercooling. (3) The leveling out of impurity concentration gradients appears to be slow in the molten metal when gravity induced convection is absent. (4) When only a part of a solid body is melted in zero gravity, the tendency of the molten part to become spherical may be much restricted. Author

N74-29894* National Research Inst. for Metals, Tokyo (Japan).
PREPARATION OF SILICON CARBIDE WHISKER REINFORCED SILVER COMPOSITE MATERIAL IN A WEIGHTLESS ENVIRONMENT, SKYLAB EXPERIMENT M561 c18
Tomoyoski Kawada, Sennosuke Takahaski, Susumu Yoshida, Eiichi Ozaqa, and Renpei Yoda *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 203-233 refs (For availability see N74-29885 19-15)
CSCL 11D

This experiment was to get Ag and SiC whisker composites with high density and uniform distribution of whiskers by heating and pressurizing sintered products above the melting point of Ag in a weightless environment. Described are the results of the examination carried out on the samples processed on Skylab and comparison with those prepared on the ground. The SiC nominal volume fraction was 2, 5, and 10%. The size of each sample was 8mm in diameter and about 30mm in length. The microhardness was measured on a longitudinal section of the sample. Also the distribution density of whiskers was estimated by observing the section under an optical microscope. The difference between the Skylab samples from the ground based test samples was clearly revealed in the uniform distribution of hardness values and the nonexistence of any floating whiskers. Author

N74-29895* Rensselaer Observatory, Troy, N.Y. Dept. of Chemistry.
VAPOR GROWTH OF GeTe SINGLE CRYSTALS IN MICRO-GRAVITY c26
H. Wiedemeier, F. C. Klaessig, S. J. Wey, and E. A. Irene *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 235-256 refs (For availability see N74-29885 19-15)
CSCL 20B

The positive effects of micro-gravity on crystal growth and fundamental properties of the vapor transport reaction were established by analyzing the results of GeSe and GeTe vapor transport experiments performed on board Skylab. The analysis was based on a direct comparison of GeSe and GeTe crystals and of mass transport rate data obtained on earth and in space. For this purpose, a total of six transport experiments employing different concentrations of transport agent (GeI4) and two temperature gradients were performed during the Skylab 3 and 4 missions. Extensive ground-based studies demonstrated that the crystal morphology and the mass transport rates of the above systems are affected by the transport conditions, in particular by gravity-driven convection. The results demonstrate unambiguously a considerable improvement of the space crystals in terms of surface perfection, crystalline homogeneity and defect density. The observation of greater mass transport rates than expected in micro-gravity environment is of basic scientific and technological significance. This indicates that conventional transport models are incomplete and demonstrates that crystals of improved quality can be grown at reasonable rates by this technique in space. Results are of practical importance for the modification of crystal growth techniques on earth. Author

N74-29896* Alabama Univ., Huntsville. Dept. of Physics.
SEEDED, CONTAINERLESS SOLIDIFICATION OF INDIUM ANTIMONIDE c26
H. U. Walter *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 257-273 refs (For availability see N74-29885 19-15) (Contract NAS8-28304)
CSCL 20B

Directional solidfication of a containerless melt that was suspended at the end of a seed crystal was employed to produce crystals of InSb during Skylab missions(SL3 and SL4). Single crystals with well developed growth facets (/110/, /111/, /(-1)(-1)(-1)/ were obtained. Analysis by X-ray topography and chemical etching shows that the crystals are of high structural perfection. Virtually no dislocation clusters were observed; average dislocation density is of the order of 100/sq cm. The density of dislocations decreases linearly in the center section of space-grown

crystals. A sample that was heavily doped with selenium appears to be homogeneously doped in the center section only. Striated solute distribution is observed in the first and the last portion of the space-grown crystal. Author

N74-29897* Massachusetts Inst. of Tech., Cambridge.
STEADY STATE GROWTH AND SEGREGATION UNDER ZERO GRAVITY: InSb c26
A. F. Witt, M. Lichtensteiger, M. C. Lavine, and C. J. Herman *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 275-299 refs (For availability see N74-29885 19-15)
CSCL 20B

It was established that ideal diffusion controlled steady state conditions, never accomplished on earth, were achieved during the growth of Te-doped InSb crystals in Skylab. Surface tension effects were found to establish non-wetting conditions under which free surface solidification took place in confined geometry. It was further found that, under forced contact conditions, surface tension effects led to the formation of surface ridges (not previously observed on earth) which isolated the growth system from its container. In addition, it was possible for the first time to identify unambiguously: the origin of segregation discontinuities associated with facet growth, the mode of nucleation and propagation or rotational twin boundaries, and the specific effect of mechanical-shock perturbations on segregation. The results obtained prove the advantageous conditions provided by outer space. Thus, fundamental data on solidification thought to be unattainable because of gravity induced interference on earth are now within reach. Author

N74-29898* University of Southern Calif., Los Angeles.
DIRECTIONAL SOLIDIFICATION OF InSbGaSb ALLOYS c26
James F. Yee, Sanghamitra Sen, Kalluri Samra, Mu-Ching Lin, and William R Wilcox *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 301-374 refs (For availability see N74-29885 19-15)
CSCL 20B

In(x)Ga(1-x)Sb with x = 0.5, 0.3 and 0.1 was directionally solidified under a variety of conditions. Identical gradient-freeze experiments were performed vertically with the heater on top, horizontally and in Skylab (SL-3). Experiments were also performed in SL-4 with the heater temperature increased. Bridgman-Stockbarger and vertical gradient freeze experiments were performed at USC. A transverse magnetic field was used to inhibit convection in some of the USC Bridgman experiments. A wide range of grain sizes was observed, but with no influence of growth conditions yet observed. The number of twins in the space-processed samples was much less than in the earth-processed samples. Equilibrium between the growing crystal and the bulk melt was more nearly achieved in the horizontally processed ingot. Gas bubbles were trapped in the ingots when the ampoules were back-filled with helium. The bubbles were more evenly distributed in the Skylab ingots. Microcracks were more numerous in inhomogeneous regions of the ingots. The ingots formed in SL-3 had a smaller diameter than the tube, but those in SL-4 did not. The grains were very difficult to distinguish from one another in five out of six Skylab ingots. Author

N74-29899* Texas Instruments, Inc., Dallas.
INFLUENCE OF GRAVITY-FREE SOLIDIFICATION ON MICROSEGREGATION c26
John T. Yue and Fred W. Voltmer *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 375-425 refs (For availability see N74-29885 19-15)
CSCL 20B

Single crystalline germanium has been grown for the first time in space aboard Skylab Mission No. 2. The crystal growth experiment, designed to characterize the influence of gravity-free solidification on microsegregation of a semiconductor material, contained three crystals. One was doped with Ga; the second with Sb; and the third with B. Portions of the germanium crystals were remelted and subsequently resolidified at 5 microns per second under controlled conditions by the gradient freeze technique. Detailed spreading resistance measurements made on the Ga doped Ge crystals indicate that microsegregation in space is reduced by two to five-fold in the bulk and eight-fold near the surface, while macrosegregation in space is reduced by six-fold in the bulk. The effective segregation coefficient for Ga in Ge was analyzed extensively and was found to be larger for space solidification. This has the implication that the solute boundary layer at the growth interface in space is correspondingly thinner. The solidification interface is significantly smoother and is found to be initially convex toward the melt in space. A convective mixing model has been advanced to exaplain the absence of gravity on convective mixing and solute segregation during solidification. Author

N74-29900* Howard Univ., Washington, D.C.
M558 RADIOACTIVE TRACER DIFFUSION c17
A. O. Ukanwa *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 425-456 refs (For availability see N74-29885 19-15)
CSCL 11F

This experiment was performed in Skylab 3 with two objectives in mind. First, the experimental self-diffusion coefficients for liquid zinc were to be determined in a convection-free environment. Secondly the reduction in convective mixing in earth gravity by going into the zero-gravity environment of space was to be estimated. The experiment was designed to utilize high temperatures and linear thermal gradients provided by the M518 Multipurpose Electric Furnace, and the radioactivity of zinc-65 of 245-day half-life to investigate self-diffusion in liquid zinc. The distribution of zinc-65 tracer, after melting, maintaining at soak temperature for 1 hour of soak time and then resolidifying, was obtained by sample sectioning. The concentration of activity of each section (microcurie-gram) was plotted against positions along the sample axial and radial position. Experimental data and theoretical results from solution of Fick's law of diffusion in one dimensional were compared. Samples tested on earth showed very rapid diffusion. Diffusion coefficient in unit gravity was 50 times the zero-gravity diffusion coefficient of Skylab. Author

N74-29901* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENT M566 COPPER-ALUMINUM EUTECTIC c17
Earl A. Hasemeyer, Charles V. Lovoy, and L. L. Lacy *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 457-467 refs (For availability see N74-29885 19-15)
CSCL 11F

The experimental hardware in Skylab flights 3 and 4 functioned satisfactorily to process three specimens in the low gravity of a space environment. The multi-purpose Electric Furnace melted portions of three copper-aluminum specimens in each flight, held them at a soaking temperature, then re-solidified the molten portions at a controlled rate. Nondestructive evaluations including electrical resistivity, have been completed. Preliminary data from quantitative metallography indicate that the aligned eutectic in specimens processed in Skylab 3 and 4 have fewer defects than ground-based specimens, specifically an improvement of 12% in average defect spacing and a decrease of 20% in the average fault density. Author

N74-29902* California Univ., Los Angeles.
HALIDE EUTECTIC GROWTH c18
A. S. Yue and J. G. Yu *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 469-489 refs (For availability see N74-29885 19-15)
CSCL 11D

Fiberlike NaCl-NaF eutectic mixtures have been produced on earth and in space by the directional solidification technique. It was found that continuous and discontinuous NaF fibers were embedded in a NaCl matrix from ingots grown in space and on earth, respectively. The production of continuous fibers in a eutectic mixture was attributed to the absence of convection current in the liquid during solidification. Macroscopic and microscopic examinations on longitudinal and transverse sections of space-

grown and earth-grown ingots were made. The best microstructures were obtained from ingots grown in space. These microstructures were compared with those produced on earth with and without convection current in the liquid during growth. Optical transmittance measurements of transverse and longitudinal sections of the space-grown and earth-grown ingots were carried out. It was found that for a given sample thickness, the highest percentage of transmittance was obtained from ingots grown in space. It was gound that the thinner the sample, the higher the transmittance over a range of wavelengths, in agreement with the general optical property of transparent materials exposed to electromagnetic waves. Author

N74-29903* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SCIENCE DEMONSTRATIONS ON SKYLAB IN THE MATERIAL PROCESSING AREA
Tommy C. Bannister *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 491-595 refs (For availability see N74-29885 19-15)
CSCL 13H

Twelve science demonstrations were accomplished on Skylab missions 3 and 4. These activities were defined in response to crew requests for time-gap fillers and were designed to be accomplished using onboard equipment. Nine of the demonstrations were in the area of materials science and space processing. They are described, and preliminary results are given. These nine science demonstrations are: diffusion in liquids, ice melting, liquid floating zone, immiscible liquids, mechanics series, and charged particle mobility. Author

N74-29904* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MATERIALS PROCESSING UNDER ZERO GRAVITY, AN ASSESSMENT AFTER SKYLAB
Ernst Stuhlinger *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 507-523 (For availability see N74-29885 19-15)
CSCL 13H

Results achieved from materials processing experiments conducted during the Skylab Program are briefly discussed, and their potential applications described. Future plans for additional experiments during the Apollo Soyuz Project and the Space Shuttle Program are mentioned. A.L.

N74-29905*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCESSINGS OF THE THIRD SPACE PROCESSING SYMPOSIUM ON SKYLAB RESULTS, VOLUME 2
Jun. 1974 547 p refs Symp. held at Huntsville Ala., 30 Apr. - 1 May 1974
(NASA-TM-X-70253; M-74-5-Vol-2) Avail: NTIS HC $30.50
CSCL 13H

For Volume 1, see N74-29885. For individual titles, see N74-29906 through N74-29926.

N74-29906* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING PAYLOADS FOR SPACELAB c14
K. R. Taylor, R. L. Hammel (TRW Systems Group, Redondo Beach, Calif.), A. G. Smith (TRW Systems Group, Redondo Beach, Calif.), P. R. Mock (TRW Systems Group, Redondo Beach, Calif.), and R. D. Stevenson (TRW Systems Group, Redondo Beach, Calif.) *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 525-564 refs (For availability see N74-29905 19-15)
CSCL 14B

Discussed are the definitions of facilities which will serve the research needs of a large group of users. These facilities (payloads) are derived by several combinations of items from a large inventory of modular, reusable, research equipment which enables ready response to many flight opportunities. Workable concepts have been prepared and submitted to the Spacelab design activity. These designs permit the flying of either partial or dedicated payloads. The technical integrity of the modular approach to payload design/integration and the utility of commercial-equipment technology are also addressed in this paper. Author

N74-29907* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING EXPERIMENTS ON SOUNDING ROCKETS c31
Hans F. Weunscher *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 565-579 refs (For availability see N74-29905 19-15)
CSCL 16D

The use of sounding rockets for the conduct of, and verification of, processing experiments and techniques under conditions of weightlessness are summarized. The experimental payloads, project management, mission schedules are also discussed. A.L.

N74-29908* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FURNACE SYSTEMS DEVELOPMENT c14
B. R. Aldrich *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 581-593 refs (For availabiiity see N74-29905 19-15)
CSCL 14B

Space processing facilities, including furnace systems, will, only vaguely resemble their laboratory and industry conterparts. Within the constraints imposed by the host vehicle, flight furnaces will be more versatile. They will provide a wider range of controlled heating, cooling and sample positioning to accommodate the requirements of experiment scientists, and will be more efficiently packaged. The development of these advanced furnace systems will be an essential element in the orderly evolution of space processing technology. Author

N74-29909* Westinghouse Research Labs., Pittsburgh, Pa.
SYSTEM DESIGN CONSIDERATIONS FOR FREE-FALL MATERIALS PROCESSING
R. G. Seidensticker *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 595-601 (For availability see N74-29905 19-15)
CSCL 13H

The design constraints for orbiting materials processing systems are dominated by the limitations of the flight vehicle/crew and not by the processes themselves. Although weight, size and power consumption are all factors in the design of normal laboratory equipment, their importance is increased orders of magnitude when the equipment must be used in an orbital facility. As a result, equipment intended for space flight may have little resemblance to normal laboratory apparatus although the function to be performed may be identical. The same considerations influence the design of the experiment itself. The processing requirements must be carefully understood in terms of basic physical parameters rather than defined in terms of equipment operation. Preliminary experiments and analysis are much more vital to the design of a space experiment than they are on earth where iterative development is relatively easy. Examples of these various considerations are illustrated with examples from the M518 and MA-010 systems. While these are specific systems, the conclusions apply to the design of flight materials processing systems both present and future. Author

N74-29910* General Electric Co., Philadelphia, Pa.
ELECTROMAGNETIC CONTAINERLESS MELTING AND SOLIDIFICATION IN THE WEIGHTLESS ENVIRONMENT c17
R. T. Frost, E. H. Stockhoff, and G. Wouch *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 60 603-646 refs (For availability see N74-29905 19-15)
CSCL 11F

General facility concepts capable of processing the widest range of possible important containerless processing experiments within reasonable technology constraints are indicated. An important part of the work has been to make an up-to-date summary of these experiment possibilities. An attempt has been made to consider materials based on importance in terms of new scientific data or possible future commercial applications. Author

N74-29911* Intersonics, Inc., Chicago, Ill.
ACOUSTIC FIELD POSITIONING FOR CONTAINERLESS

PROCESSING
R. R. Whymark *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 647-677 refs (For availability see N74-29905 19-15)
CSCL 13H

The non-contact positioning of materials in a space processing chamber is accomplished using a new type of acoustic levitator. Liquid and solid materials are positioned using a single source of sound. Fine control of position may be obtained by motion of an acoustical reflector. Electrical power required is usually less than 100 watts. The system operates satisfactorily at high and low temperatures and is adaptable as an add-on feature to existing space experiments. Containerless melting and solidification can be performed and a freely suspended liquid can be shaped to the contour of the sound field. Experiments are described in which aluminum, glass and plastic materials are melted and solidified in the containerless state. The system has applications to containerless crystal growth, melting and related processes.
Author

N74-29912* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ACOUSTICAL POSITIONING CHAMBER FOR SPACE PROCESSING
T. G. Wang, M. M. Saffren, and D. D. Elleman *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 679-690 (For availability see N74-29905 19-15)
CSCL 13H

By readily levitating, positioning, and manipulating materials placed in it, the acoustical resonator can serve a variety of space processing operations, such as drawing crystals, degassing, and stirring of melts, and casting.
Author

N74-29913* Lockheed Missiles and Space Co., Huntsville, Ala.
FLUID MOTIONS IN A LOW-G ENVIRONMENT c12
P. G. Grodzka, S. V. Bourgeois, M. R. Brashears, and L. W. Spradley *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 691-727 refs (For availability see N74-29905 19-15)
CSCL 20D

The importance of natural convection and other fluid motions in low-g space processing is now well recognized. Recent space experiments in the areas of natural convection and material processing, as well as results of theoretical studies, have yielded much needed information on fluid behavior in low-g environments. The state of knowledge of fluid motions in low-g environments is reviewed and the dimensional analysis approach used to assess the relative importances of various driving forces for fluid flow in four of the Skylab material processing experiments outlined. Results of dimensional analyses for the Skylab experiments, subsequently confirmed by actual space data, are presented. Finally, the limits of dimensional analysis in assessment studies are indicated.
Author

N74-29914* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROLE OF GRAVITY IN PREPARATIVE ELECTROPHORESIS c04
M. Bier (Arizona Univ., Tucson), J. O. N. Hinckley (Arizona Univ., Tucson), A. J. K. Smolka (Arizona Univ., Tucson), M. J. Binder (Arizona Univ., Tucson), M. Coxon (Arizona Univ., Tucson), T. W. Nee (Arizona Univ., Tucson), M. O. Scully (Arizona Univ., Tucson), H. S. T. Shih (Arizona Univ., Tucson), and R. S. Snyder *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 729-253 refs (For availability see N74-29905 19-15)
CSCL 06C

Electrophoresis has contributed significantly to the methodology of biological sciences, and shows the potential for large scale fractionation of a wide range of medically important substances, including living cells. Gravity plays an important role in the electrophoretic process, and hence the importance of the NASA effort to develop a zero-gravity separation facility as part of its shuttle program. The current state of art in electrophoresis is reviewed with particular emphasis on the role of gravity and the possible use of istachophoresis. This technique utilizes a discontinuous buffer system, and appears to be the only high resolution electrophoretic technique currently available for separation of living cells.
Author

N74-29915* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PREPARATIVE ELECTROPHORESIS OF LIVING LYMPHOCYTES c04
C. J. VanOss (State Univ. of New York, Buffalo), P. E. Bigazzi (State Univ. of New York, Buffalo), C. F. Gillman (State Univ. of New York, Buffalo), and R. E. Allen *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 755-762 refs (For availability see N74-29905 19-15)
(Contract NAS8-29745)
CSCL 06C

Vertical liquid columns containing low molecular weight dextran density gradients can be used for preparative lymphocyte electrophoresis on earth, in simulation of 0 gravity conditions. Another method that has been tested at 1 G, is the electrophoresis of lymphocytes in a upward direction in vertical columns. By both methods up to 10 to the 7th power lymphocytes can be separated at one time in a 30 cm glass column of 8 mm inside diameter, at 12 v/cm, in 2 hours. Due to convection and sedimentation problems, the separation at 1 G is less than ideal, but it is expected that at 0 gravity electrophoresis will prove to be a uniquely powerful cell separation tool. The technical feasibility of electrophoresing inert particles at 0 G has been proven earlier, during the flight of Apollo 16.
Author

N74-29916* National Bureau of Standards, Washington, D.C.
MATERIALS SCIENCE AND MANUFACTURING IN SPACE: THE NBS PROGRAM OF GROUND BASED RESEARCH c26
E. Passaglia and R. L. Parker *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 763-835 refs (For availability see N74-29905 19-15)
CSCL 20B

National Bereau of Standards work for NASA in support of NASA's Space Processing Program is described. The objectives of the NBS program are to perform ground-based studies of those aspects of space that could possibly provide a unique environment for making materials more perfect or more pure. The approach taken deals primarily with experimental and theoretical studies of the possible effects of the absence of gravitational forces on those materials preparation processes where the presence of gravity may be important in reducing perfection or purity. The materials preparation processes studied comprise 6 tasks in the areas of crystal growth, purification and chemical processing, and the preparation of composites. They are: (1) crystal perfection in Czochralski growth; (2) evaporative preparation of ultrahigh purity materials; (3) vacuum effects in the preparation of composite materials; (4) melt shape in weightless crystal growth; (5) vapor transport synthesis and crystal growth of oxides; and (6) surface traction and other surface phenomena.
Author

N74-29917* Bell Telephone Labs., Inc., Murray Hill, N.J.
STUDIES OF LIQUID FLOATING ZONES ON SL-IV, THE THIRD SKYLAB MISSION c12
J. R. Carruthers *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 837-856 refs (For availability see N74-29905 19-15)
CSCL 20D

The behavior of liquid floating zones in a zero-gravity environment was studied by Dr. E. Gibson on SL-4. These experiments were designed from the results of previous work on floating zones in a simulated zero-gravity model. Molten floating zones are used on earth for the crystal growth and zone refining of reactive materials. The Skylab studies give some insight into the problems associated with the development of the technique for the future space processing of materials. Preliminary results are presented on the stability of the liquid zone surface under static, rotational and vibrational conditions without gravitational constraints.
Author

N74-29918* General Dynamics/Convair, San Diego, Calif.
LOW-GRAVITY DISPERSION OF SOLIDS IN LIQUID

METALS c17

S. Kaye and J. Raat *In NASA*. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 14 Aug. 1974 p 857-885 refs (For availability see N74-29905 19-15)

(Contracts NAS8-27806; NAS8-29620)

CSCL 11F

A number of space processes, particularly the preparation of various types of composite materials, involve mixtures of liquid metals and solid particles. The two predominant problems associated with the attainment of such mixtures are; (1) free dispersion of the solids, possible only if they are perfectly wetted by the liquid, and (2) mixture stability. The results of related experimental investigations and theoretical studies are presented. Author

N74-29919* Rockwell International Corp., Downey, Calif.

OXIDE GLASS PROCESSING IN SPACE c18

R. A. Happe and L. E. Topol *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 887-923 refs (For availability see N74-29905 19-15)

(Contracts NAS8-28014; NAS8-28991)

CSCL 11D

The experimental work performed thus far has resulted in the preparation of new glass compositions not reported heretofore in the open literature. Recent experiments which have resulted in the formation of 1/4-inch-diameter glass samples from two compositions, suggest that containerless melting and cooling as envisioned for space operations is of real technological significance. To date studies of space glasses have by choice been confined to oxide glasses only. It is felt that the applications for such glasses are more readily predictable than for the other materials, and that many of the principles that will evolve from a study of oxide glasses, which can be melted in air, permit a more direct approach to non-oxide materials in the future. The compositions being studied are all very simple in terms of traditional glass practices, none of them contianing more than three major constituents. Future efforts should be concerned with more complex compositions, both to cover a broader range of optical properties and to enhance glass-forming tendencies. Author

N74-29920* IIT Research Inst., Chicago, Ill.

SPACE PROCESSING OF CHALCOGENIDE GLASSES c18

D. C. Larsen, M. A. Ali, and W. B. Crandall *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 925-938 (For availability see N74-29905 19-15)

CSCL 11D

Manufacture of chalcogenide glasses in space will eliminate many of the causes of optical non-homogeneity and contamination that are inherent in earth-bound manufacture. A program is outlined to demonstrate the feasibility of various techniques and processes that will be utilized to manufacture chalcogenide glasses in space. Amorphous character, purity, and homogeneity parameters are being investigated at various stages of the glass forming process. These parameters in merit index form will serve to provide guidelines for the design of the actual melting experiment in space, and for the optimization of the exact chalcogenide composition to be included in the space experiments. Author

N74-29921* United Aircraft Corp., East Hartford, Conn. Research Labs.

EUTECTIC SOLIDIFICATION c18

F. C. Douglas and F. S. Galasso *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 939-952 refs (For availability see N74-29905 19-15)

CSCL 11D

The possibilities of using the low-gravity space environment for the processing of directionally solidified materials in order to remove the limitations imposed by the L-g earth environment have led to a careful evaluation of the directional solidification process and the results commonly obtained. Defects in the regularity of the microstructure have been identified as one of the most important areas where present processing technology needs to be improved. One-g environment material processing must also be carefully characterized before it can be determined if zero-g processing will produce significant benefits in eutectic and off-eutectic solidification. It is suggested that a combination of experimental and analytical thermal studies will be required to optimize the solidification process in order to minimize the structural defects which occur due to present processing techniques. Author

N74-29922* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CONCENTRATION CHANGES DURING EUTECTIC SOLIDIFICATION c17

Biliyar N. Bhat *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 953-961 refs (For availability see N74-29905 19-15)

CSCL 11F

Thermotransport (or thermal diffusion, Soret effect) is shown to cause significant amount of segregation during the directional solidification of aluminum-copper eutectic. The concentration changes are predicted quantitatively and they are a function of temperature gradient, rate of melting and solidification and the time of soaking. There is a fair agreement between the experiments and calculations. A process is suggested where these concentration changes may be minimized. Author

N74-29923* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

EFFECT OF GRAVITY ON LIQUID PHASE SINTERING

T. Mookherji (Teledyne Brown Eng.), W. B. McAnelly (Teledyne Brown Eng.), and E. C. McKannan *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 963-1001 refs (For availability see N74-29905 19-15)

CSCL 13H

The unique conditions offered by the earth orbital environment in material processing involving both solid and liquid phases, such as liquid phase sintering, were studied. An experimental development program involving both test and theoretical work was initiated. Experimental work using material combinations selected such that maximum information about the effect of gravity can be derived has been conducted. Wetting of the solid phase by the liquid during sintering is an important phenomenon in liquid phase sintering, and gravity has influence on both capillary phenomenon and density segregation; hence, material combinations were selected such that these two effects can be suitably studies. The experimental work is meant to form the basis for similar comparative work done under low-g conditions. The part of the model dealing with the capillary phenomenon, as related to liquid phase sintering and the effect of gravity on it, suggest that gravity will have negligible effect on the Bond number and that the cohesive force is dependent on both the amount of liquid phase and the angle of contact. Author

N74-29924* Battelle Columbus Labs., Ohio.

IMMISCIBLE MATERIALS AND ALLOYS c18

A. J. Markworth, S. H. Gelles, J. J. Duga (Mater. Res. and Computer Simulation), and W. Oldfield *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 1003-1029 refs (For availability see N74-29905 19-15)

CSCL 11D

Only immiscible materials which involve a fluid phase have a potential advantage when considered for space processing. Processing of such systems at low gravity can lead to a material which is very homogeneous and contains a finely dispersed mixture of phases. Materials with such structures may exhibit potentially useful properties for such applications as superconductors, dispersion-strengthened materials, superplastic materials, permanent magnets, etc. These conclusions have resulted from review of past efforts in the field of low-g processing of materials containing a liquid phase miscibility gap and from present efforts dealing with such systems. These studies have concentrated on precipitation of liquid droplets in a host liquid during cooling through the miscibility gap. This effort has been to study the agglomeration of the droplets both experimentally and through computer simulation in order to understand the mechanisms involved and to deduce the effect of gravity on the droplet

distribution and resulting structure of the solidified material. The agglomeration mechanisms treated in detail are those due to diffusional growth and collision processes caused by Stokes on convection current-induced droplet migration. Author

N74-29925* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE ELECTRICAL PROPERTIES OF LOW-G PROCESSED IMMISCIBLE ALLOYS c17
G. H. Otto (Alabama Univ., Huntsville) and L. L. Lacy *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 1031-1044 refs (For availability see N74-29905 19-15)
CSCL 11F

When dispersed or mixed immiscibles are solidified on earth, a large amount of separation of the constituents takes place due to differences in densities. However, when the immiscibles are dispersed and solidified in zero-gravity, density separation does not occur, and unique composite solids can be formed with many new and promising electrical properties. By measuring the electrical resistivity and superconducting critical temperature of zero-g processed Ga-Bi samples, it has been found that the electrical properties of such materials are entirely different from the basic constituents and the ground control samples. The finest dispersions are obtained only in a low-gravity environment. Our results indicate that space-processed immiscible materials may form an entirely new class of electronic materials. The interesting electrical properties of directionally solidified Al-Cu eutectic, a two-component alloy consisting of Al and Al2Cu which was processed on Skylab (M566) are briefly reviewed. The electrical resistivity of directionally solidified eutectics with a lamellar structure are highly anisotropic and have been studied both experimentally and theoretically. The local resistivity of the space-processed samples are compared to a ground control sample and to the expected theoretical results. Author

N74-29926* National Aeronautics and Space Administration, Washington, D.C.
PROJECTED FUTURE SPACE PROCESSING ACTIVITIES
James H. Bredt *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 1045-1050 (For availability see N74-29905 19-15)
CSCL 13H

A brief review is presented on where the space processing program stands with respect to its long range objectives and what plans have been made to pursue them in the next several years. These objectives are to make a permanent place for space processing as an integral part of the world's materials technology, and from this broad viewpoint there are two things that are clearly necessary to reach the program's goal. One of them is a space flight system large enough to support materials research and development work on a significant scale and eventually support manufacturing operations as well if these develop. The other is a group of materials scientists and engineers large enough to do space research and development on a scale that can impact materials science and technology and eventually develop manufacturing as well as research applications of space processing. Author

N74-29927*# Mississippi State Univ., State College. Engineering and Industrial Research Station.
STIFFNESS AND DAMPING OF AN INHERENTLY COMPENSATED GAS LUBRICATED BEARING OF SQUARE GEOMETRY Annual Report, Jan. - Dec. 1973
A. Kent Stiffler and David M. Smith Dec. 1973 64 p refs (Grant NGR-25-001-050)
(NASA-CR-138307; EIRS-ME-75-1) Avail: NTIS CSCL 13I

The load, mass flow, stiffness, and damping for an inherently compensated, multiple-inlet, externally pressurized square thrust bearing are analyzed. Small perturbation methods are used to linearize Reynolds' equation, and numberical methods are employed to find the solution to the resulting equations. Design curves are presented in terms of restrictor coefficient, supply pressure, and location of the inlets for low squeeze numbers. Optimum bearing stiffness occurs at a restrictor coefficient between one and two. At this value the damping is a minimum and negative damping (instability) can be present at supply pressures exceeding four atmospheres. Stiffness increases with supply pressure. Optimum damping occurs at a restrictor coefficient equal to five. Stiffness is considerably reduced but can be improved by operating at high supply pressures. Author

N74-29928# National Aerospace Lab., Tokyo (Japan).
AN EXPERIMENTAL INVESTIGATION OF FLAT-PLATE HELICAL INDUCERS FOR ROCKET TURBOPUMPS
Kenjiro Kamijo and Akio Suzuki 1973 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-345) Avail: NTIS HC $4.50

The effects of leading edge sweepback and hub taper on the cavitation performance and the outlet flow field were investigated experimentally with flat plate helical inducers. The present experiment, conducted in a water cavitation tunnel, places the emphasis upon measurements of three-dimensional velocity distributions with use of a five-hole pitometer, as well as overall performances, and visual observations of cavitations. Improved suction performances obtained with a sweptback inducer may be attributed to the preventing effect of the sweepback on cavitation developments near the blade tip. In addition, the inducer showed an improvement in efficiency and reduced three-dimensionality of the flow. The flow field measurement of a tapered hub inducer revealed somewhat small deviation angle and less steep axial velocity distribution, which may have resulted in larger head rise than a parallel hub inducer. The effect of dissolved air in water on the cavitation performances and some problems encountered are described briefly. Author

N74-29929*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRACTION AND FILM THICKNESS MEASUREMENTS UNDER STARVED ELASTOHYDRODYNAMIC CONDITIONS
L. D. Wedeven 1974 35 p refs Proposed for presentation at the Lubrication Conf., Montreal, 8-10 Oct. 1974; sponsored by ASME and Am. Soc. of Lubrication Engr.
(NASA-TM-X-71584; E-8036) Avail: NTIS HC $3.25 CSCL 11H

Traction measurements under starved elastohydrodynamic conditions were obtained for a point contact geometry. Simultaneous measurements of the film thickness and the locations of the inlet lubricant boundary were made optically. The thickness of a starved film for combination rolling and sliding conditions varies with the location of the inlet boundary in the same way found previously for pure rolling. A starved film was observed to possess greater traction than a flooded film for the same slide roll ratio. For a given slide roll ratio a starved film simply increases the shear rate in the Hertz region. The maximum shear rate depends on the degree of starvation and has no theoretical limit. Traction measurements under starved conditions were compared with flooded conditions under equivalent shear rates in the Hertz region. When the shear rates in the Hertz region were low and the film severely starved, the measured tractions were found to be much lower than expected. Author

N74-29930*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
DRAW FORMING OF SCALE SHUTTLE EXTERNAL TANK DOME GORES Final Report, 1 Mar. - 15 May 1974
G. Garfield May 1974 32 p
(Contract NAS8-30666)
(NASA-CR-120311; MDC-G7413) Avail: NTIS HC $4.75 CSCL 13H

The process for manufacturing external tank dome gores is discussed. The test fixture and test procedure are described. The characteristics of the draw forming die are analyzed. The specific subjects included are: (1) forming, (2) trimming, (3) cleaning, and (4) heat treatment. Author

N74-29931*# Virginia Univ., Charlottesville. Div. of Mechanical Engineering.
THE EFFECT OF SUPPORT FLEXIBILITY AND DAMPING ON THE DYNAMIC RESPONSE OF A SINGLE MASS FLEXIBLE ROTOR IN ELASTIC BEARINGS
R. G. Kirk and E. J. Gunter Apr. 1972 98 p refs
(Grant NGR-47-005-050)
(NASA-CR-138968; ME-4040-106-72U) Avail: NTIS HC $8.00 CSCL 13I

The dynamic unbalance response and transient motion of the single mass Jeffcott rotor in elastic bearings mounted on damped, flexible supports are discussed. A steady state analysis of the shaft and the bearing housing motion was made by assuming synchronous precession of the system. The conditions under which the support system would act as a dynamic vibration absorber at the rotor critical speed were studied. Plots of the rotor and support amplitudes, phase angles, and forces transmitted were evaluated by the computer and the performance curves were plotted by an automatic plotter unit. Curves are presented on the optimization of the support housing characteristics of attenuate the rotor synchronous unbalance response. Author

N74-29932*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF AN ALL-METALLIC RESILIENT-PAD GAS-LUBRICATED THRUST BEARING
William J. Anderson Washington Jul. 1974 34 p refs
(NASA-TN-D-7724; E-7966) Avail: NTIS HC $3.25 CSCL 13I

A resilient-pad gas thrust bearing that does not contain any elastomers in the bearing assembly is described and analyzed. The bearing consists of sector-shaped pads mounted asymmetrically on resilient foil beams. The effects of bearing design parameters on performance are shown. Performance of a resilient-pad bearing is compared with that of a pivoted-pad bearing. Author

N74-29933*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF EXPERIMENTAL AND PREDICTED PERFORMANCE OF 150-MILLIMETER-BORE SOLID AND DRILLED BALL BEARINGS TO 3 MILLION DN
Herbert W. Scibbe and Harold E. Munson Washington Jul. 1974 29 p refs
(NASA-TN-D-7737; E-7722) Avail: NTIS HC $3.25 CSCL 13I

Seven 150-millimeter-bore ball bearings were run under 8900-newton (2000-lbf) thrust load at speeds from 6670 to 20,000 rpm (1 million to 3 million DN). Four of the bearings had conventional solid balls, and three bearings had drilled (cylindrically hollow) balls with 50-percent mass reduction. The bearings were under-race cooled and slot lubricated with a type 2 ester oil at flow rates from 4.35 x 0.001 to 5.94 x 0.001 cubic meter/min (1.15 to 1.57 gal/min). Friction torque and temperature were measured on all bearings. While there was considerable spread in the temperature data, the drilled ball bearings tended to run slightly cooler than the solid ball bearings at higher speeds. No significant difference in torque was noted, however, between the solid and drilled ball bearings. One bearing of each type was rerun at 17,800-newton (4000-lbf) thrust load. The solid ball bearings performed satisfactorily at 3 million DN. However, at about 2 million DN the drilled ball bearing experienced a broken ball, and cracks appeared in other balls as a result of flexure fatigue. Metallurgical examination of the cracked balls indicated a brittle structure in the bore of the drilled balls. Author

N74-29934*# Artech Corp., Falls Church, Va.
GLASS-BEAD PEEN PLATING Final Report, Mar. - Dec. 1973
James R. Graves Feb. 1974 20 p
(Contract NAS5-21925)
(NASA-CR-139041) Avail: NTIS HC $4.00 CSCL 13H

Peen plating of aluminum, copper, and nickel powders was investigated. Only aluminum was plated successfully within the range of peen plating conditions studied. Optimum plating conditions for aluminum were found to be: (1) bead/powder mixture containing 25 to 35% powder by weight, (2) peening intensity of 0.007A as measured by Almen strip, and (3) glass impact bead diameter of at least 297 microns (0.0117 inches) for depositing-100 mesh aluminum powder. No extensive cleaning or substrate preparation is required beyond removing loose dirt or heavy oil. Author

N74-29935# Oak Ridge Y-12 Plant, Tenn.
FILLER-WIRE FEEDER AND POSITIONER FOR ELECTRON-BEAM WELDING
J. L. Murphy and P. W. Turner 22 Feb. 1974 24 p
(Contract W-7405-eng-26)
(Y-1932) Avail: NTIS HC $4.00

A filler-wire feeder and positioner device is described for electron-beam welding to provide automatic features that are necessary for efficient wire feeding in a vacuum chamber. The feeder can accommodate as many as nine individual weld passes and is programmed by the use of dial switches. The positioner has three axes of movement, each of which can be controlled from the exterior of the vacuum chamber of the electron-beam welding machine. These axes of movement are used to locate, precisely, the wire feed nozzle in relation to the weld joint groove and to raise or lower the nozzle between weld passes. Author (NSA)

N74-29936# Dow Chemical Co., Golden, Colo.
EVALUATION OF THE CRYOFIT TUBE JOINING SYSTEM IN SELECTED PLUTONIUM CHEMICAL PROCESSING SOLUTIONS
J. M. Macki, K. Terada, and R. L. Kochen 27 Dec. 1973 8 p refs
(Contract AT(29-1)-1106)
(RFP-2134) Avail: NTIS HC $4.00

The Ni-Ti alloy Cryofit joining system has been evaluated for corrosion resistance to selected solutions encountered in the chemical processing of plutonium. Results indicated the Cryofit system has useful resistance to Al(NO3)3, H2C2O4, KOH, and very dilute H2SO4. The Cryofit system is not suitable for HO3 service or for NH2SCN service when used with 304 stainless steel. The Cryofit tube fitting system provides a means of connecting tubes and pipes without flanges, welds, or elevated temperatures. Permanent connections are made by removing a Cryofit coupling from liquid nitrogen and inserting the tubes to be joined into the ends of the coupling. As the coupling warms from liquid nitrogen to room temperature, it shrinks onto the tubing with tremendous force generated by internal stresses. Author (NSA)

N74-29937# Dow Chemical Co., Golden, Colo.
DESIGN DATA FOR HOLLOW CATHODE GAS-FED ARCS
D. G. Williams 19 Dec. 1973 18 p refs
(Contract AT(29-1)-1106)
(RFP-1965) Avail: NTIS HC $4.00

Engineering information is provided to fabricate and operate equipment for generating hollow cathode arcs. Topics include equipment selection and design, operating procedures, and operating characteristics. Hollow-cathode operating characteristics for a wide range of cathode sizes, gas-flow rates, gas types, and cathode-anode spacings are covered. Author (NSA)

N74-29938# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
FEASIBILITY OF EDDY CURRENT MEASUREMENT OF FERRITE CONTENT IN STAINLESS STEEL WELDS
G. D. Lassahn and R. L. Moment 17 Dec. 1973 10 p refs
(Contract AT(29-1)-1106)
(RFP-2125) Avail: NTIS HC $4.00

A phase-sensitive eddy current system was used to measure the presence of ferrite in an austenitic stainless steel matrix. Measurements were made on pressed powder specimens and on a weld in Type 304L stainless steel. The data obtained showed that small amounts of ferrite, on the order of 1 to 3%, could easily be detected. Variation in ferrite with position within the weld was also detected with good reproducibility. Absolute values for the ferrite content were not obtained as accurate standards for calibration were not available. Author (NSA)

N74-29939# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
LAMB-WAVE INSPECTION OF WELDS IN STAINLESS STEEL TUBES
G. W. Schrick 26 Dec. 1973 7 p
(Contract AT(29-1)-1106)
(RFP-2139) Avail: NTIS HC $4.00

An ultrasonic Lamb-wave inspection technique was developed for use in inspecting the gas tungsten arc welds in small diameter stainless steel tubes for lack of penetration. The particular technique was employed because of the ability to

introduce the sound into the material a distance from the weld. A conventional shear-wave technique was tried without success. Author (NSA)

N74-29940# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL STUDY OF ULTRASOUND REFLECTION FROM A MOLTON CORE DURING SPOT WELDING
N. M. Tarasov and N. A. Varukha 30 Jan. 1974 12 p Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 130-135
(AD-773894; FTD-HT-23-193-74) Avail: NTIS CSCL 13/8

The effect of the size and shape of the molten core as well as the width of the transition zone on the reflection of ultrasound off the phase transition boundary during melting was studied. The amplitude of the ultrasonic signal reflected off the core depends on the width of the transition zone and, to a lesser extent, on the shape of the core. For slightly thermoconductive materials with a sharp phase transition boundary for example, KH18 N9 T steel the signal reflected from the molten core is commensurate with the signal relfected from an air cavity of similar dimensions. In highly thermoconductive materials ultrasound reflection from the core is considerably weaker. GRA

N74-29941# Titeflex, Springfield, Mass.
ANTI-CHAFE HOSE Final Report
Richard A. Synder Feb. 1974 87 p refs
(Contract DAAJ02-72-C-0088; DA Proj. 1F1-62205-A-119)
(AD-777802; USAAMRDL-TR-74-2) Avail: NTIS CSCL 13/11

The report presents the results of a research and development program conducted to establish the feasibility of, and the design and test criteria for, a chafe-resistant flexible fluid hose for Army helicopter applications. The vibratory chafing tests developed and conducted under this program demonstrate the feasibility of a flexible high-pressure fluid hose with integral elastomeric chafe guard which provides a tenfold increase in mean-time-between-failures (MTBF) compared to similar unprotected hose subjected to identical chafing conditions at -65F, +275F, and +450F. This significant improvement was achieved without sacrifice of other performance parameters. (Modified author abstract) GRA

N74-29942# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
EFFECTS OF ELECTROLESS NICKEL PROCESS VARIABLES ON QUALITY REQUIREMENTS
Fielding Ogburn and Christian E. Johnson Oct. 1973 39 p refs
(AD-778753; NBSIR-73-240; RIA-R-RR-T-6-75-73) Avail: NTIS CSCL 11/3

Deposition rate, phosphorus content, hardness, appearance, and metal distribution are reported for deposits from two acid, hypophosphite type electroless nickel baths, one proprietary and one non-proprietary. The baths were operated under a variety of conditions with variations of composition. Extensive data is given on the relation of deposit hardness to phosphorus content and to heat treatment at 100, 200, and 400C. Author (GRA)

N74-29943# Southwest Research Inst., San Antonio, Tex.
BASELINE DATA FROM TESTS CONDUCTED ON STANDARD MS TUBE FITTINGS Final Report, Jul. 1972 - Sep. 1973
Charles R. Ursell and Clayton R. Franz Mar. 1974 141 p
(Contract F33657-71-C-0914)
(AD-778995; ASD-TR-74-8) Avail: NTIS CSCL 13/11

This report contains the results of tests conducted on MS flareless tubing fittings for use as baseline data for comparison with advanced aerospace fittings. In order to establish a baseline with which to compare test data derived from tests conducted on the new generation of tube fittings, the MS standard flareless fitting was subjected to all of the tests designed for this test program and classified as a Class II fitting. Since, however, these fittings are designed for 3000 PSI and 275F maximum working pressure and temperature, they were tested at these parameters instead of the 4000 PSI working pressure and 450F maximum temperature designated for the new type fittings (Class 1). (Modified author abstract) GRA

N74-29944# Kentucky Univ., Lexington.
PROJECT THEMIS METAL DEFORMATION PROCESSING Annual Report, 1 Sep. 1972 - 31 Dec. 1973
Hans Conrad and Mehmet Doner Apr. 1974 107 p refs
(Contract F33615-69-C-1027; AF Proj. 7912)
(AD-779720; AFML-TR-74-48; AR-5) Avail: NTIS CSCL 13H

A new analytical approach was developed for establishing the local stress state and temperature (including regions near the surface) in axisymmetric extrusions. Also a numerical method (finite differences) for solving the plasticity equations and thereby predicting the flow lines has been developed. The plastic deformation kinetics derived from hot extrusion tests on Ti-50A and Ti-5Al-2.5 Sn are in good accord with those for the high temperature deformation of these materials in simple tension or compression and it was deduced that the rate-controlling mechanism is glide and climb in Ti-50A and viscous glide in Ti-5Al-2j5 Sn. Further, the change from the single maximum type of visioplasticity pattern to the double maximum type appears to be governed mainly by the plastic flow behavior of the material. Friction studies employing the ring forging test indicate that for effective lubrication during the hot working of titanium alloys the ratio of viscosity eta of a glass lubricant to the flow stress sigma should be in the range 0.0001 - eta/sigma - 0.01 (poise/dyne/sq cm) at interface velocities of 0.5 - 1.0 in./min. (Modified author abstract) GRA

N74-29945# Boeing Aerospace Co., Seattle, Wash.
CERAMIC AIRFRAME BEARINGS Final Report, 22 Feb. 1973 - 22 Feb. 1974
Jan W. VanWyk Feb. 1974 114 p
(Contract N00019-73-C-0230)
(AD-779050; D180-17996-1) Avail: NTIS CSCL 13/9

A ceramic-solid-lubricant material screening test program was conducted to select materials and lubricants for a plain spherical bearing design. Friction and wear screening testing was conducted at stress levels to 7500 psi using PTFE, graphite and molybedum disulfide lubricants. Best performance was obtained with an alumina rider specimen sliding against a silicon nitride plate lubricated with an MoS2 solid lubricant compact. A lubricant reservoir bearing design development program was conducted. The manufacturing details for fabricating plain spherical bearings using AD995 alumina balls in contact with an alumina lubricant reservoir race are described. Four bearings indicated low wear when tested for 50 hours in a simulated helicopter rotor pitch link test. These tests were conducted for 50 hours at 243 rpm with pitch link loads of 275 plus or minus 925 pounds and a swashplate tilt angle of 9 degrees. Tests conducted under simulated hydrofoil flap bearing operation resulted in fracture of the ceramic outer race. These tests were conducted as a load spectrum increasing in 1000 psi increments while oscillating plus or minus 10 degrees at 20 cpm. The highest load capacity attained was 8570 psi. Author (GRA)

N74-29946# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HOLOGRAPHY AND NONDESTRUCTIVE TESTING
N. Batalova 16 Apr. 1974 6 p Transl. into ENGLISH from Pravda (USSR), no. 252, 26 Oct. 1973 p 4
(AD-779204; FTD-HT-23-1786-74) Avail: NTIS CSCL 14/5

Holographic techniques are reported for the detection of component damage in machinery and a method is also presented for the early diagnosis of disease with the application of a holographic light beam. M.C.F.

N74-29947# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
INTERACTIONS AMONG THE VARIOUS PHENOMENA INVOLVED IN THE DESIGN OF DYNAMIC AND ROTARY MACHINERY AND THEIR EFFECTS ON RELIABILITY Final Report, 1 Sep. 1972 - 31 Aug. 1973
Dimitri Kececioglu, Louie B. Chester, and Chester F. Nolf, Jr. 31 Aug. 1973 330 p
(Contract N00014-67-A-0209-0002; NG Proj. 097-375)
(AD-779134) Avail: NTIS CSCL 13/9

Endurance strength testing under reversed bending of AISI 4340, 4130, 1038 and 1018 steel 0.040 in. diameter wires was completed and distribution S-N diagrams were prepared. Endurance strength testing under reversed bending of AISI 4130

steel rods of 0.0937 in. and 0.2700 in. diameters and a notch sensitivity analysis were accomplished. Axial fatigue endurance testing was completed on AISI 1018 and 1038 steel rods to generate distributional Goodman strength diagrams. The computer program to determine the equation of the leat-squares best-fit curve of the Goodman diagram was completed. The experimental results of the entire program have been summarized in the report. Author (GRA)

N74-29948# American Cyanamid Co., Wayne, N.J.
EFFECTS OF COUPLING AGENTS ON THE FAILURE MECHANISMS OF ADHESIVE BONDED JOINTS Final Report, 1 May 1972 - 15 Jun. 1973
Francis C. Rauch and Thomas B. Reddy 30 Nov. 1973 119 p refs
(Contract F33615-72-C-1650; AF Proj. 7342)
(AD-779712; AFML-TR-73-215) Avail: NTIS CSCL 13/5

The objective of the research program was to establish a structure-property correlation by means of detailed studies of the interaction of selected coupling agents with aluminum and titanium adherends and with epoxy and polyimide resins. The report describes the results obtained during the first year. The study focused on four coupling agents of the type XSi(OR)3 where X is an organofunctional group. Detailed absorption data was obtained on three of the four compounds studied, namely those with X = C2H5, CH2+CH and NH2CH2CH2CH2 and R=C2H5. Physical studies of the interaction of these agents, plus (CH2OCH2)-Ch2-O-(CH2)3 Si-(OCH3)3, with pure aluminum, 2024-T3 aluminum alloy, pure Ti and Ti-6Al-4V alloy were carried out and the results interpreted. GRA

N74-29949# Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy and Materials Science.
THE ANALYTICAL DETERMINATION OF FRICTION FOR FLOW THROUGH CONICAL CONVERGING DIES Final Technical Report, Mar. - Dec. 1973
Keith J. Barker, Betzalel Avitzur, and Walter C. Hahn, Jr. Dec. 1973 41 p refs
(Contract F33615-72-C-1153; AF Proj. 7351)
(AD-779677; AFML-TR-74-21) Avail: NTIS CSCL 13/8

The effects of friction upon the intermediate and final distorted grids for wire drawing and/or extrusion were analytically studied for an assumed triangular velocity field. An upper-bound solution for the process was used. This solution predicted that the shape of the final and intermediate distorted grids were functions of the process geometry and of friction. Initially, combinations of reduction and semi-cone angle were found for which the triangular velocity field was energetically preferred over an existing spherical velocity field. The analytical final distorted grids were then compared to experimentally obtained final distorted grids to determine the experimental friction. This was done by plotting calibration curves for distortion where friction served as the parameter and by comparing the actual distortion with the family of calibration curves. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-29950 State Univ. of New York, Stony Brook.
LASER LIGHT SCATTERING STUDIES OF CRITICAL LIQUID MIXTURES Ph.D. Thesis
Shiu Pang Lee 1974 161 p
Avail: Univ. Microfilms Order No. 74-14801

The intensities and Rayleigh linewidths for the isobutyric acid-water and polystyrene-cyclohexane systems at their critical concentrations were measured as a function of scattering angle and temperature above their phase separation temperatures. The Rayleigh linewidth was measured for the isobutyric acid-water liquid mixture and for the polystyrene in cyclohexane solution. Dissert. Abstr.

N74-29951*# Stanford Research Inst., Menlo Park, Calif.
LIDAR MEASUREMENTS OF THE VARIABILITY OF STRATOSPHERIC PARTICULATES Semiannual Report
Philip B. Russell, William Viezee, and Richard D. Hake Jul. 1973 56 p refs Sponsored in part by DOT
(Contract NAS2-7261; SRI Proj. 2217)
(NASA-CR-139273) Avail: NTIS HC $6.00 CSCL 20E

Laser radar observations were made to provide information on the distribution of particulate material in the stratosphere between 33,000 feet and 98,000 feet. The observations are part of a program to assess the impact of climatic changes that may result from perturbation of the upper atmosphere by a world high-altitude aircraft fleet. Results are presented as vertical profiles of the scattering ratio and the aerosol backscattering ratio. E.J.O.

N74-29952# Defence Standards Labs., Maribyrnong (Australia).
THERMAL BLOOMING OF A PULSED GAUSSIAN LASER BEAM
B. C. H. Wendlandt Mar. 1974 27 p refs
(Rept-557) Avail: NTIS HC $4.50

The propagation of a focused, pulsed Gaussian laser beam through the atmosphere in the absence and presence of fog and light cross winds is studied numerically using a quadratic approximation for the refractive index distribution. In the calculations diffraction, natural convection, saturation, and other effects due to finite molecular relaxation times are all taken into account. Author

N74-29953# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
NEODYMIUM LIQUID LASER: CONSTRUCTION, PROPERTIES, AND SCATTERING IN THE ACTIVE MEDIUM
R. S. Lang Jul. 1973 74 p refs In GERMAN; ENGLISH summary
(IPP-4-111) Avail: AEC Depository Libraries HC $5.75

The construction of a neodymium liquid laser with circulating liquid is described. The properties of the laser were studied. In the free running mode of the laser the cross section for the stimulated emission micron was measured. In the same mode, the comparison of theory and experiment shows backscattering. The especially long laser cell lowers the thresholds for simulated scattering effects to power densities occurring in the actively Q-switched laser. Simulated Raman and Brillouin scattering has thus been detected. In order to demonstrate Brillouin scattering, the necessary line-narrowing of the laser emission was produced by a pilot oscillator with small bandwidth. The experimental arrangement allowed the laser output characteristics to be studied at three different bandwidths. Author (NSA)

N74-29954# Raytheon Co., Waltham, Mass. Research Div.
ADVANCED TECHNIQUES FOR IMPROVING LASER OPTICAL SURFACES Semiannual Technical Report
Charles B. Willingham Mar. 1974 82 p
(Contract F19628-73-C-0280)
(AD-779673; S-1654; AFCRL-TR-74-0055) Avail: NTIS CSCL 20/5

The program is a study of surface-finishing techniques considered to be capable of improving the surface quality of laser optical materials. Chemical and chemical-mechanical polishing, ion-beam polishing, bowl-feed and continuously recycled abrasive superpolishing techniques will be developed for single-crystal and polycrystalline potassium chloride and calcium fluoride, and polycrystalline zinc selenide. A new class of abrasives which are transparent to infrared laser radiation will be studied. (Modified author abstract) GRA

N74-29955# TRW Systems Group, Redondo Beach, Calif.
CHEMICAL LASER REACTIONS CROSS-SECTION MEASUREMENTS Final Report, 1 Jan. 1972 - 1 Oct. 1973
J. F. Friichtenicht Apr. 1974 104 p refs
(Contract F29601-72-C-0039; ARPA Order 1256; AF Proj. 1256)
(AD-779716; AFWL-TR-73-236) Avail: NTIS CSCL 20/5

The objective of the program was the measurement of energy-dependent cross sections for each of the final vibrational states of the DF molecule resulting from the reaction F and D2 yields DF and D. In pursuit of this objective, a powerful new technique for the detailed study of gas-phase chemical reactions was developed. The high-intensity atomic beam is produced by the irradiation of thin films of solid material with a Q-switched

ruby laser pulse. For example, the flux of 4 eV fluorine atoms produced by the irradiation of a BiF3 film with a 1/2 joule laser pulse has been estimated to be 10 to the 17th power atoms /sq cm-sec at a point 60 cm from the laser target. The experiment used a crossed beam configuration where the fluorine atom beam interacts with a deuterium gas beam obtained from a nozzle source. The method of detailed energy balance was to be used to determine the internal energy state of the product molecules. Two approaches to achieving the required energy discrimination were evaluated: One involving the use of a velocity-dependent product detector and the other using mechanical velocity selection of the incident beam. (Modified author abstract) GRA

N74-29956# Naval Research Lab., Washington, D.C.
ANALYSES OF X-RAY LASER APPROACHES. 1: EXTENSION OF 3P YIELD 3S ION LASERS INTO THE VACUUM-UV REGION Interim Report
R. C. Elton May 1974 19 p refs
(RR011741)
(AD-779266; NRL-MR-2799) Avail: NTIS CSCL 20/5

The feasibility of extending existing near-ultraviolet ion lasers into the vacuum-ultraviolet spectral region is analyzed with a simple three level model. Single-pass amplification in a laser-produced plasma of reasonable length is predicted, especially for high electron temperatures. The results are intended to serve as a basis and incentive for further more complete numerical modeling and for experiments. (Modified author abstract) GRA

N74-29957# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LASER DIRECTION FINDING
V. Kalganov 19 Apr. 1974 8 p Transl. into ENGLISH from Vodnyi Transp. (USSR), no. 74, 23 Jun. 1973
(AD-779588; FTD-HT-23-1331-74) Avail: NTIS CSCL 17/8

In the TASS announcement regarding the fulfillment by Lunokhod-2 of a program of scientific and technical studies and experiments, in particular, it was mentioned that an experiment was conducted on laser direction finding of the moon vehicle. The report describes details of how this was done. GRA

N74-29958# United Aircraft Corp., East Hartford, Conn.
E-BEAM HC1 LASER Semiannual Technical Report, 30 Nov. 1973 - 31 May 1974
John A. Shirley, R. J. Hall, and B. R. Bronfin 1 Jun. 1974 19 p refs
(Contract N00014-72-C-0450)
(AD-779311; USARL-N911340-12) Avail: NTIS CSCL 20/5

The feasibility of producing stimulated emission in the 3 to 5 micron wavelength band by direct electron impact excitation of hydrogen chloride vibrational levels is being investigated theoretically and experimentally. Theoretical prediction of electrically pulsed HC1 laser performance indicate that gain coefficient in excess of 1%/sq cm should be realizable in the present experiments. Electric discharges with electron number densities up to 1.6 x 10 to the 12th power/cc have been sustained with a sq cm thermionic cathode electron gun. Author (GRA)

N74-29959# Naval Research Lab., Washington, D.C.
ARPA-NRL-LASER PROGRAM Semiannual Technical Report, 1 Jan. - 30 Jun. 1973
Apr. 1974 59 p refs
(ARPA Order 2062; NRL Proj. K03-08A; NRL Proj. N01-21)
(AD-779261; NRL-MR-2767) Avail: NTIS CSCL 20/5

The ARPA-NRL high energy laser program is concerned with the development of laser technology in four program areas; Chemical Lasers, Electric Discharge Lasers; High Power Glass Lasers and New Laser Techniques. GRA

N74-29960# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ATMOSPHERIC ATTENUATION OF LASER RADIATION FROM 0.76 TO 31.25/UM Environmental Research Papers
Robert A. McClatchey and John E. A. Selby 3 Jan. 1974 175 p refs
(AF Proj. 7670; AF Proj. 8603)
(AD-779726; AFCRL-TR-74-0003; AFCRL-ERP-460) Avail: NTIS CSCL 20/6

High resolution atmospheric transmittance curves are presented for the spectral region 320 to 13,200/cm (0.7576 to 31.25 micrometers). These spectra are useful as a guide for selecting laser wavelengths for atmospheric propagation studies in this spectral region. In addition, this report provides attenuation coefficients for those lines of the CO, HF, DF, and CO2 laser systems which suffer the least atmospheric attenuation. A new aerosol model is introduced here, taking into account recent measurements of the complex index of refraction of aerosol particles. Author (GRA)

N74-29961# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
MINIATURE MOLECULAR FREQUENCY SOURCE Interim Technical Report, 15 Jun. - 15 Nov. 1973
James J. Gallagher Dec. 1973 28 p refs
(Contract DAAB07-73-C-0065; DA Proj. 1S6-62705-A-058)
(AD-779471; ECOM-0065-2-73; ITR-2) Avail: NTIS CSCL 20/5

Investigations performed on a miniature molecular frequency source are discussed. The work on the small laser and each component required for the stabilization of the source is described. The final system, as it is planned, is described. For the projected 50 mW output of the laser, calculations indicate that this is sufficient power for the control system. Work toward laboratory observations of the fluorescence signals is discussed. Author (GRA)

N74-29962# IBM Watson Research Center, Yorktown Heights, N.Y.
STUDY OF ULTRAVIOLET LASERS Final Report, 4 Feb. 1972 - 28 Feb. 1974
Stephen C. Wallace, R. T. Hodgson, and R. W. Dreyfus 1974 12 p refs
(Contract DAHC04-72-C-0017)
(AD-779470; AROD-10437-10-P) Avail: NTIS CSCL 20/5

Recent work is reported on problems of producing vacuum ultraviolet lasers: problems of producing yet shorter wavelengths, of tuning the output and of raising the efficiency. GRA

N74-29963# Radio Corp. of America, Lancaster, Pa. Electro-Optics Products.
GaAs LARGE OPTICAL CAVITY (LOC) LASER DIODE FOR COMMUNICATIONS SYSTEMS Interim Technical Report, 16 May - 15 Nov. 1973
J. T. OBrien Mar. 1974 58 p refs
(Contract DAAB07-73-C-0062)
(AD-779472; ECOM-0062-2) Avail: NTIS CSCL 20/5

Work has continued on the development of a LOC double heterojunction laser diode to be used as the transmitting component for an optical communicator. A thermal analysis of the LOC diode, mounted in the microwave package, is given along with measurements of the total device inductance. A new epitaxial system has been constructed which incorporates an all-electronic temperature control and programming system. Results of both four and five layer epitaxial junctions are discussed. Pulse driver developments and performance characteristics of the laser devices are given at duty cycles up to 3% at pulse repetition frequencies in excess of 2.5 MHz. Work has been initiated on the construction of a two position life test rack capable of operating the LOC laser diodes at currents up to 15 amperes and pulse repetition rates of 5.0 MHz at 10 nanoseconds pulse width. Author (GRA)

N74-29964# Purdue Research Foundation, Lafayette, Ind.
STUDY OF THE CHARACTERISTICS OF THE HOLOGRAPHIC STEREOMODEL FOR APPLICATION IN MENSURATION AND MAPPING, PART 2 Final Report, Sep. 1971 - Oct. 1973
Truman F. Kellie and Warren H. Stevenson Oct. 1973 74 p refs
(Contract DAAK02-72-C-0063)
(AD-779180; ETL-CR-73-74-Pt-2) Avail: NTIS CSCL 14/5

Theoretical and experimental investigation into the problems and possibilities of using holography for photogrammetry. Specific areas investigated where intermodulation distortion, field of view and geometric distortions for Fresnel and focused image hologram. A new theory of intermodulation noise is presented and verified.

Optimum geometries for hologram recording and viewing are derived. Author (GRA)

N74-29965# Valpey Corp., Holliston, Mass.
DESIGN OF AN OPTICAL RECEIVER AND LASER COLLIMATOR INCLUDING A STATUS REPORT ON MANUFACTURE Final Report, 1 Mar. - 10 Dec. 1973
Edward P. Wallerstein 10 Dec. 1973 38 p
(Contract F19628-73-C-0182; AF Proj. 7600)
(AD-779670; Rept-73-0301; AFCRL-TR-74-0013) Avail: NTIS CSCL 20/6

The Optical Receiver consists of two main sections, a twelve inch aperture Cassegrain telescope, and a two channel photodetector assembly. The light collected by the Cassegrain is divided by a beamsplitter such that 6943 A light is transmitted and the remainder of the visual and near I.R. spectrum is reflected. Both channels contain accurately boresighted variable field stops, suitable collimating and reimaging optics, and a high efficiency fast rise time photomultiplier. The transmission channel contains a tuneable 1 A wide narrow band filter for use between 6940 A and 6945 A. The laser collimator is an all fused silica 11.5 inch aperture 18 X beam expander. The system is capable of diffraction limited performance at collimated focus, and in addition has adjustable beam spreading capability. The combination of fused silica optics with an invar cell provides extremely high thermal stability. (Modified author abstract) GRA

N74-29966# Sperry Rand Research Center, Sudbury, Mass.
NONLINEAR ELECTROOPTIC MATERIALS FOR COVERT LASERS Final Report, 24 Aug. - 30 Dec. 1973
Michael Kestigian and J. Bruce Thaxter Apr. 1974 51 p
(Contract DAAB07-74-C-0022; DA Proj. 1S6-62705-A-056)
(AD-779476; SCRC-CR-74-2; ECOM-0022-F-74) Avail: NTIS CSCL 20/5

Investigations carried out and the results obtained during a four month program on nonlinear electrooptic material for covert lasers are described. These studies included Czochralski direct-melt single crystal growth of strontium barium niobate and strontium barium lithium niobate. Optical measurements such as degradation studies, dielectric experiments, and electrooptic coefficient investigations were conducted. On the basis of these results, a strontium barium lithium niobate composition was selected to be the optimum state-of-the-art nonlinear electrooptic material for Q-switch applications. Two models were fabricated for use with covert lasers (Ho doped YLF). Both of these models employ a matched pair of strontium barium lithium niobate single crystals. The first model has been designed and fabricated as a direct replacement for lithium niobate in available electronic Q-switch systems, while the second model will yield an improved lower voltage requirement Q-switch assembly. Author (GRA)

N74-29967# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EFFECTS OF GASEOUS CONTAMINANTS ON GAS DYNAMIC LASER PERFORMANCE
Roger Tennant, Rudolph Vargas, and Steven Hadley 1974 8 p refs Presented at 12th AIAA Aerospace Sci. Meeting, Washington, D. C., 30 Jan. - 1 Feb. 1974 Submitted for publication
(AD-779759; AFWL-TR-74-505; AIAA-74-178) Avail: NTIS CSCL 20/5

A shock tube driven gas dynamic laser is being used to study the effect of gaseous contaminants upon laser performance. The performance is being evaluated in terms of the small signal gain measured at 10.6 micrometers (P (18) transition). Contaminants being studied include sulfur dioxide, carbon monoxide, and hydrogen chloride. Comparisons of measured and calculated values of small signal gain have been made for cases where adequate kinetic rate data was available. Allowable levels of these contaminants and their implications are discussed. (Modified author abstract) GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-29968 Central Electricity Generating Board, London (England).
NITRIDING OF STEEL Selective bibliography, 1969 - 1973
P. G. Williams, comp Jun. 1974 10010 p refs
(CE-BIB-5.1) Avail: Issuing Activity

Abstracts of 31 reports concerning the effects of nitriding on the mechanical properties of steel alloys are presented. F.O.S.

N74-29969 Central Electricity Generating Board, London (England). Information Services.
STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS IN AQUEOUS ENVIRONMENTS A Selective Bibliography, 1954 - Dec. 1973
P. G. Williams, comp. Jun. 1974 34 p refs
(CE-Bib-238) Avail: Issuing Activity

An up to date bibliography was compiled on stress corrosion of austenite components in existing power plants. The bibliography was divided into two sections: (1) general references on the stress corrosion of austenite stainless steels in high nickel alloys, and (2) specific references on the stress corrosion austenitic materials in high temperature, high pressure aqueous solutions. Author

N74-29970 University of Southern Calif., Los Angeles.
HIGH TEMPERATURE DEFECT STRUCTURE OF COBALT DOPED ALPHA-ALUMINA Ph.D. Thesis
Bulusu Venkateswara Dutt 1974 149 p
Avail: Univ. Microfilms Order No. 74-14435

Room temperature optical absorption spectra, electron spin resonance at 15-18 K, high temperature 1620 electrical conductivity, and emf measurements are correlated to determine the high temperature defect structure of cobalt-doped alpha-alumina. Proposals of defect models by others based on the three kinds of measurements are reviewed and in some cases, a reinterpretation is offered. The standard free energy of incorporation of CoO in Al2O3 forming the defects CoAl and A1-3 sub 1 is estimated. This is used to calculate the solubility of cobalt in Al2O as a function of pO2 at 1620 C. Dissert. Abstr.

N74-29971 Case Western Reserve Univ., Cleveland, Ohio.
THE EFFECT OF ALLOYING ON THE FERMI SURFACE OF MAGNESIUM Ph.D. Thesis
Larry Joseph Hornbeck 1974 223 p
Avail: Univ. Microfilms Order No. 74-16492

A 60 kilogauss field modulation spectrometer system was developed to perform accurate de Hass-van Alpen (DHVA) amplitude and frequency measurements on magnesium alloy single crystals, under the adverse conditions of degraded signal to noise ratio which results from impurity scattering. Detailed attention was paid to electronic effects and alloy inhomogeneity which can modify the measured frequencies and amplitudes. A theory was developed and applied to giving quantitative corrections to scattering temperatures and DHVA frequencies arising from alloy inhomogeneity on a macroscopic scale. In addition, the technique and instrumentation were developed for growing highly reactive magnesium alloy single crystals using a zone melting method, in a manner which avoids cellular concentration structures, impurity contamination, and strains. The above techniques were applied to a test of the rigid band model (RBM) and Soven model of alloying for relative valences of + 1 (Mg-In) and -1 (Mg-Li). Dissert. Abstr.

N74-29972*# Battelle Columbus Labs., Ohio.
MATERIALS PROCESSING IN SPACE M512, PHASE B REPORT
H. E. Pattee and R. E. Monroe 15 Jul. 1973 74 p
(Contract NAS8-28725)

(NASA-CR-120266) Avail: NTIS HC $6.75 CSCL 11F

The metallographic characterization, analysis, and property measurement of ground samples for comparison with those processed on Skylab are described. Experiments on metals melting and exothermic brazing are summarized, and results are presented. E.J.O.

N74-29973# Technische Hochschule, Hanover (West Germany).
STUDY ON THE CATALYTIC ACTIVITY OF THIN NICKEL LAYERS UP TO THE REGION OF ATOMIC DISPERSION Ph.D Thesis [UNTERSUCHUNG DER KATALYTISCHEN AKTIVITAET DUENNER NICKEL-SCHICHTEN BIS IN DEN BEREICH ATOMARER DISPERSION]
Volker Haertel 21 Feb. 1973 117 p refs In GERMAN
Avail: NTIS HC $9.00

Very thin films on graphite substrates were tested in a ultrahigh hydrogen vacuum to determine the correlation between catalytic properties and atom concentration. Observed was the formation rate for methane per nickel atom and time unit at constant H2 pressure as well as the film thickness of the evaporating nickel film. A Monto Carlo simulation of layer growth using the atomic nucleation theory showed that catalytic activity developed through the interaction of several nickel atoms and that single atoms were catalytic inactive. Transl. by G.G.

N74-29974# Technischen Universitaet, Hanover (West Germany).
CHEMICAL COMPOSITION EFFECTS ON THE DEFORMATION RESISTANCE OF STEEL DURING COLD AND HOT FORMING Ph.D. Thesis [UEBER DEN EINFLUSS DER CHEMISCHEN ZUSAMMENSETZUNG AUF DIE FORMAENDERUNGSFESTIGKEIT VON STAHL BEIM KALT- UND WARMUMFORMEN]
Hans-Joachim Beer 1973 225 p refs In GERMAN
Avail: NTIS HC $14.25

The effects of nickel, molybdenum, and chromium alloys on the deformation resistance of low carbon steels were studied by compression and torsion tests. Deformation resistance of the investigated steels increased with higher content of alloying materials logarithmically at room temperatures when compared with unalloyed steel. A higher carbon content decreased deformation resistance. Transl. by G.G.

N74-29975# Technischen Universitaet, Hanover (West Germany).
INCREASED CREEP RESISTANCE STRENGTH IN ALUMINUM-NICKEL-ALLOYS BY HYDROGEN Ph.D. Thesis [ERHOEHUNG DER DAUERSTANDFESTIGKEIT VON ALUMINIUM-NICKEL-LEGIERUNGEN DURCH WASSERSTOFF]
Yuji Enokido 1973 137 p refs In GERMAN
Avail: NTIS HC $10.00

Increased creep resistance of aluminum nickel alloys through melt reaction products from nickel and hydrogen as well as the thermochemical reasons for increased creep resistance are studied. Experimental and crystallographic results show that creep resistance is strongest when hydrogen-free nickel is added to hydrogen-rich aluminum for producing aluminum nickel alloys. Transl. by G.G.

N74-29976# Technische Hochschule, Darmstadt (West Germany).
MECHANICAL PROPERTIES OF STEEL DURING STATIC AND CYCLIC LOADING AFTER A MASSIVE DEFORMATION Ph.D. Thesis [MECHANISCHE EIGENSCHAFTEN VON STAHL BEI STATISCHER UND WECHSELNDER BEANSPRUCHUNG]
Guenter Flemming 1972 153 p refs In GERMAN
Avail: NTIS HC $10.75

The effects of massive deformation on mechanical properties of steels during loading are considered. Drawing tests, hardness measurements, vibration and relaxation tests on various cold formed materials show that: (1) the Bauschinger effect is independent from the yield limit before deformation and from the structural texture; (2) cold forming solidifies the material; (3) cold forming decreases ductility; (4) fatigue strength is independent of deformation direction; and (5) hardness increases after cold forming regardless of deformation direction.
Transl. by G.G.

N74-29977# Technische Universitaet, Clausthal-Zellerfeld (West Germany).
EFFECT OF HYDROSTATIC PRESSURE ON YIELD STRESS AND STRAIN PROPERTIES OF METALLIC WORKING MATERIALS Ph.D. Thesis [EINFLUSS VON HYDROSTATISCHEM DRUCK AUF FLEISSSPANNUNG UND FORMAENDERUNGSVERMOEGEN METALLISCHER WERKSTOFFE]
Walter Lorrek 24 Jul. 1972 149 p refs In GERMAN
Avail: NTIS HC $10.50

Hydrostatic pressure effects on the mechanical behavior of ductile and brittle metal materials during drawing, compression, and other forming processes were studied. Results indicated that ductile materials increased their deformation potentiality markedly under pressure drawing with relative yield stress increase of about 1% kbar. In general, the logarithmic dependence of fracture strain deformation in brittle materials under hydrostatic pressure started linear and changed to a nonlinear mechanism gradually. Transl. by G.G.

N74-29978# Technische Universitaet, Brunswick (West Germany).
TRACES ON METAL ELECTRODES AFTER VOLTAGE SURGE IN VACUUM Ph.D. Thesis [DIE SPUREN AUF METALLELEKTRODEN NACH EINEM SPANNUNGSDURCHBRUCH IM VAKUUM]
Wilhelm Meister 1973 114 p refs In GERMAN
Avail: NTIS HC $8.75

Electrode surface properties after voltage surge are studied by analyzing cratering and scarring effects for their possible development source and by evaluating the possibility of measurement method for micropores. A quantitative relationship is established between crater and bubble distribution frequency with porosity; a certain correlation is found between distribution frequency and impurities in pores. Transl. by G.G.

N74-29979# National Aeronautical Lab., Bangalore (India).
A UNIFIED THEORY FOR THE PORTEVIN-Le CHATELIER EFFECT IN SUBSTITUTIONAL ALLOYS
V. Srinivasan Dec. 1973 32 p refs Submitted for publication
(NAL-TN-43) Avail: NTIS HC $4.75

A comprehensive theory of dynamic strain ageing is formulated to explain the Portevin-Le Chatelier effect in substitutional alloys. This theory leads to explicit expressions for the kinetics of dynamic strain ageing. It is assumed that dynamic strain ageing will give rise to serrated flow if moving dislocations are immobilized by a critical size of their atmospheres. Postulating on the basis of available experimental evidence that moving dislocations and their average velocity depend on the applied strain rate and test temperature, relations are deduced from the kinetic equations to describe the effect of strain rate, temperature and solute concentration on the initiation of serrated flow. This theory is applied to the available experimental observations of serrated flow in aluminum-magnesium-zinc and gold-indium alloys. Migration energies for the solute and single vacancies in the aluminum base alloy are evaluated to be 0.5 and 0.7 eV respectively. It is suggested that magnesium with a migration energy of 0.55 eV causes the necessary dislocation locking for the occurrence of serrated flow in aluminum-magnesium-zinc alloy. In addition, the present model suggests that the average dislocation velocity in gold-indium alloy should decrease with solute concentration. Author

N74-29980# Defence Standards Labs., Maribyrnong (Australia).
METALLURGICAL EXAMINATION OF SPACE VEHICLE METAL SPHERES
L. S. Heard Mar. 1974 25 p refs
(Rept-581) Avail: NTIS HC $4.25

Two metal spheres, suspected to have come from space vehicles of Russian origin, were found in New South Wales. The spheres are pressure vessels which are mounted on support frames attached to the exterior of the space ship. The dynamic pressures and aerodynamic heating generated during reentry causes structural separation of some of the missile components. The spheres appear to survive the reentry effects because of their shape, their location within the space vehicle, and the materials used in their construction. Examination of the spheres

was conducted to determine the alloy or alloys used, the methods of fabrication (with emphasis on welding and weld quality), the temperature and condition of the spheres on impact, and the general metallurgical history. Author

N74-29981*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DYNAMIC OXIDATION BEHAVIOR AT 1000 AND 1100 C OF FOUR NICKEL-BASE CAST ALLOYS, NASA-TRW VIA, B-1900, 713C, AND 738X
Williams A. Sanders Washington Aug. 1974 25 p refs
(NASA-TN-D-7682; E-7865) Avail: NTIS HC $3.00 CSCL 11F

The superalloys NASA-TRW VIA, B-1900, 713C, and 738X were tested cyclically and isothermally for resistance to oxidation in high velocity gas streams for 100 hours at specimen temperatures of 1000 C and 1100 C. Alloys VIA and B-1900, which were the most oxidation resistant, displayed slight and very similar weight changes and metal losses. Alloy 713C also sustained only slight metal losses, but it exhibited some tendency to spall. Alloy 738X was found to be the most susceptible to cyclic oxidation; this resulted in heavy spalling, which in turn caused high weight losses and high metal losses. Oxidation test results are related to the amounts of chromium aluminum, and the refractory metals in the alloys investigated. Author

N74-29982*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME METAL-GRAPHITE AND METAL-CERAMIC COMPOSITES FOR USE AS HIGH ENERGY BRAKE LINING MATERIALS
Robert C. Bill Washington Aug. 1974 22 p refs
(NASA-TN-D-7756; E-7845) Avail: NTIS HC $3.00 CSCL 11D

Materials were studied as candidates for development as potential new aircraft brake lining materials. These families were (1) copper-graphite composites; (2) nickel-graphite composites; (3) copper - rare-earth-oxide (gadolinium oxide (Gd2O3) or lanthanum oxide (La2O3)) composites and copper - rare-earth-oxide (La2O3) - rare-earth-fluoride (lanthanum fluoride (LaF3)) composites; (4) nickel - rare-earth-oxide composites and nickel - rare-earth-oxide - rare-earth-fluoride composites. For comparison purposes, a currently used metal-ceramic composite was also studied. Results showed that the nickel-Gd2O3 and nickel-La2O3-LaF3 composites were comparable or superior in friction and wear performance to the currently used composite and therefore deserve to be considered for further development. Author

N74-29983*# State Univ. of New York, Stony Brook.
FREE ENERGIES OF FORMATION OF WC AND WZC AND THE THERMODYNAMIC PROPERTIES OF CARBON IN SOLID TUNGSTEN
D. K. Gupta and L. L. Seigle [1974] 26 p refs
(Grant NGR-33-015-035)
(NASA-CR-139406) Avail: NTIS HC $4.50 CSCL 11F

The activity of carbon in the two-phase regions - W + WC and W + W2C was obtained from the carbon content of iron rods equilibrated with mixtures of metal plus carbide powders. From this activity data the standard free energies of formation of WC and W2C were calculated. The temperature of the invariant reaction W2C = W + WC was fixed at 1570 + or - 5K. Using available solubility data for C in solid W, the partial molar free energy of C in the dilute solid solution was also calculated. The heat of solution of C in W, and the excess entropy for the interstitial solid solution, were computed, assuming that the carbon atoms reside in the octahedral interstices of bcc W. Author

N74-29984# Virginia Polytechnic Inst. and State Univ., Blacksburg. Div. of Minerals Engineering.
RELATIONSHIP OF NITROGEN CONTENT TO THE SUSCEPTIBILITY OF AUSTENITIC STAINLESS STEELS TO STRESS CORROSION Final Technical Report
G. S. Clevinger, S. Maitra, R. Narayanan, and J. L. Lytton Aug. 1973 172 p refs
(Contract AT(40-1)-4052)
(ORO-4052-8) Avail: NTIS HC $10.75

The effect of solute nitrogen on stress-corrosion cracking of austenitic stainless steels in boiling MgCl2 was investigated in three separate ways: (1) determination of the effect of nitrogen on failure times for Type 304 stainless steel wires for various known stresses, (2) study of U-bend cracking behavior of high purity 20Cr-20Ni and commercial Type 310 alloy, and (3) use of scanning and transmission electron microscopy to determine the effect of nitrogen on the dislocation structure and cracking behavior of Type 304 U-bend specimens. NSA

N74-29985# California Univ., Livermore. Lawrence Livermore Lab.
PROCESS ON ALUMINUM-CLAD Nb3Sn
C. D. Henning, R. L. Nelson, C. O. Ward, C. L. Rowe, and D. W. Moon 20 Aug. 1973 30 p refs Presented at the Fifth Symp. on Eng. Probl. of Fusion Res., Princeton, N. J., 6-9 Nov. 1973 Sponsored by AEC
(UCRL-74964; Conf-731114-3) Avail: NTIS HC $3.50

Development of aluminum-clad Nb3Sn has continued in the pursuit of higher magnetic fields for controlled thermonuclear research. While earlier experiments confirmed the necessity of conservative cryogenic stability of such conductors, the resulting current densities from recent experiments remain quite acceptable for large applications. Cryogenic stability also provides the high reliability often required. Accordingly, more advanced superconductors tested with extensive cooling channels between the magnet turns, and temperature differences were minimized through the aluminum bonds and structural materials. In addition, liquid helium was circulated through the magnet to prevent vapor-locking during massive flux jumps. Author (NSA)

N74-29986# Atomic Energy of Canada Ltd., Chalk River (Ontario).
PRELIMINARY STUDY OF CAST AND TRANSFORMED MICROSTRUCTURES OF Zr3Al-BASED ALLOYS
E. M. Schulson Dec. 1973 36 p refs
(AECL-4652) Avail: AEC Depository Libraries HC $3.75; Atomic Energy of Can. Ltd., Chalk River $1.00

The microstructures of an arc-cast and transformed Zr8.8 wt. % Al alloy were studied using optical and scanning electron microscopy. Hardness and length-change measurements were also made. The cast structures consist of a composite mixture of two phases, a Zr(Al) solid-solution matrix and Zr2Al In the rapidly cooled parts of the casting the scale of the structure is of the order of 1 to 2 microns whereas in the more slowly cooled parts it is of the order of 8 to 10 microns. The macrohardness is 414 + or - 7 Vickers hardness number. The structures are believed to be either eutectic or cellular in origin, the former appearing to be the more probable. The presence of Zr2Al suggests that the peritectoid reaction Zr5Al3 + Zr yields 3Zr2Al goes essentially to completion as the alloy is cooled through the solid state. Evidence is presented which confirms that Zr3Al is produced via two peritectoid reactions: Zr5Al3 + Zr yields 3Zr2Al and Zr2Al + Zr yields Zr3Al. Author (NSA)

N74-29987# Dow Chemical Co., Golden, Colo. Rocky Flats Div.
ANALYSIS OF HIGH-DENSITY AREAS IN BERYLLIUM HEMISHELLS
O. A. Lee and D. H. Riefenberg 17 Jan. 1974 6 p
(Contract AT(29-1)-1106)
(RFP-2115) Avail: NTIS HC $4.00

Small areas of high and low radiographic density in hot-pressed beryllium were studied by macroetching and optical and electron microscopy. The areas were either semispherical or wormlike in shape and were found to be agglomerates of grains markedly coarser or finer than the matrix. Author (NSA)

N74-29988# British Steel Corp., Sheffield (England). Information Services.
INHOMOGENEOUS DEFORMATION DURING THE HOT ROLLING OF SHEET STEELS
A. Jones and B. Walker Feb. 1974 18 p refs
(PB-230259/4; SM/606/A) Avail: NTIS HC $4.00 CSCL 11F

Recent laboratory work has indicated that recrystallization of austenite following the hot rolling of thin steel strip, proceeds inhomogeneously through the strip thickness in such a way that a recrystallization front is set up which progresses from the strip surface to the strip center with increasing time. It has been suggested that this phenomenon is due to a variation in

the pattern of deformation through the strip thickness. The present investigation was undertaken in order to obtain information concerning the deformation conditions in the through-thickness direction of steel strip (less than 12.5mm thick) hot rolled on a laboratory mill. GRA

N74-29989# British Steel Corp., Sheffield (England). Information Services.
COMPARISON OF FRACTURE TOUGHNESS INFORMATION DERIVED FROM THE WIDE PLATE TEST AND THE DEEP NOTCH TEST
P. Terry Feb. 1974 17 p refs
(PB-230218/0; GS/PROD/149/2/73/C) Avail: NTIS HC $4.00 CSCL 11F

Wide plate and deep notch tests were carried out on BS1501:161:Grade 32 material 25mm thick. It is shown that both test configurations give similar results in terms of the temperature for 0.5% strain to fracture. Analysis of the two specimen types using COD, indicates differences in tolerable defect sizes predicted from the two tests, these differences are thought to be due to differences in residual stress levels between the wide plate and deep notch specimens, the residual stress level being higher in the wide plate specimens. The differences are only significant however below the 0.5% strain transition temperature since above this temperature residual stresses are relieved by yielding in the test plates. Some estimates of the sizes of defects which could cause failure in service as opposed to the calculated tolerable defect sizes which are considered to be safe, show the large margin of safety between tollerable and critical defect sizes. GRA

N74-29990# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Chemistry and Chemical Engineering.
ENDOCHRONIC THEORY OF VISCOPLASTICITY Final Report, 1971 - 1973
Kirk C. Valanis 1973 8 p refs Prepared in cooperation with Iowa Univ.
(Grant AF-AFOSR-2086-71; AF Proj. 9749)
(AD-779454; AFOSR-74-0594TR) Avail: NTIS CSCL 11/6

In this project the author was concerned with the inelastic behavior of solid materials at small as well as large strain. Both time-dependent as well as time-independent behavior was considered. The intent was to examine the extent to which a mathematical phenomenological theory, developed by the author, is able to predict the experimentally observed behavior of solids. (Modified author abstract) GRA

N74-29991# Watervliet Arsenal, N.Y.
DEFECT FORMATION DURING COLD HYDROSTATIC EXTRUSION
Joseph J. Pepe Apr. 1974 40 p refs
(DA Proj. 1T1-62105-AH-84)
(AD-778743; WVT-TR-74007) Avail: NTIS CSCL 11/6

To attain the maximum improvement in mechanical properties of hydrostatically extruded components, it is first necessary to fully understand the deformation process and how it affects microstructural events which ultimately control the subsequent ductility of the deformed product. Using hydrostatic extrusion as a laboratory tool, the origin of microscopic defects from both tensile and shear stress-states and the interaction of these defects with the subsequent fracture characteristics of the deformed product are discussed. Recent findings concerned with the origin of microscopic fractures such ascentral bursts and fir-tree cracking are also presented. Author (GRA)

N74-29992# British Steel Corp., Sheffield (England). Information Services.
THE ROLE OF SOME PRECIPITANTS IN THE CONTROLLED ROLLING OF LOW CARBON MICRO-ALLOYED STEELS
M. G. Frost and P. Majumdar Feb. 1974 16 p refs
(PB-230215/6; CDL/MT/17/73) Avail: NTIS HC $4.00 CSCL 11F

A series of low carbon steels with various micro-allowing additions was processed using two reverse rolling schedules, a continuous schedule and an interrupted schedule. The results indicate that a continuous schedule is always to be preferred if good impact properties are to be obtained. However, instead of the expected strengthening which might be expected from a nitrogen addition, a loss in strength resulted when 0.012 wt% nitrogen was added to a low carbon-niobium steel. However, the addition of aluminium to a 0.08 wt% Nb. 0.012 wt% N2 steel resulted in improved impact properties, but failed to restore strength levels to those found in the N2-free steels. GRA

N74-29993# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE CORROSIVE CRACKING OF HIGH STRENGTH STEEL
I. L. Rosenfeld, Z. F. Shustova, V. S. Fridman, G. G. Kuznetsov, and M. V. Conradi 10 Apr. 1974 47 p refs Transl. into ENGLISH from Korroziya i Zashchita ot Korrozii (USSR), v. 1, 1971 p 103-137
(AD-779648; FTD-MT-24-723-74) Avail: NTIS CSCL 11/6

Corrosion cracking of high strength austenitic steels and steels of other classes with average strength was investigated. The influence of steel structure, heat treatment, level of strength, impact toughness, tensile stress values, surface condition, and composition of the steel on corrosive cracking was also studied. Author

N74-29994# Army Foreign Science and Technology Center, Charlottesville, Va.
RESOLUTION OF THE 2D ALL-UNION CONFERENCE ON THE CASTING PROPERTIES OF ALLOYS
13 Aug. 1973 7 p Transl. into ENGLISH from Usapochnye Protsessy v Splavakh i Otlivkakh (Kiev), 1970 p 338-341 Conf. held at Kiev, USSR, 3-6 Sep. 1968
(AD-779609; FSTC-HT-23-1227-73) Avail: NTIS CSCL 11/6

The conference attended by 286 delegates who heard 115 papers, abstracts, and reports, dealt with the topic of contraction processes in alloys and castings. Contraction processes result in defects, such as blisters, fissures, porosity, internal stresses and deformations, which severely reduce the quality, reliability and durability of cast machine parts. The Resolution of the meeting expressed approval for the research work of various institutions and individuals in elucidating the mechanisms by which contraction defects are formed and developing practical industrial measures to combat them. It called for increased support for such research and urged the establishment of a journal: Problems of Casting. Author

N74-29995# Naval Research Lab., Washington, D.C.
INFLUENCE OF CALIBRATION PROCEDURE UPON DETERMINATION OF J SUB I SUB C FOR A TITANIUM 6 Al-4V ALLOY Final Report
G. R. Yoder and C. A. Griffis 30 Apr. 1974 27 p refs
(NRL Proj. M01-24; RR0220146)
(AD-779250; NRL-7710) Avail: NTIS CSCL 11/6

The influence of calibration procedure on the determination of J sub I sub c from fatigue-precracked elastic-plastic specimens of a Ti-6Al-4V alloy has been examined. Results are compared from five compliance-type calibrations, each derived from sets of load vs load-point-displacement diagrams which differ in origin. These sets include diagrams obtained from notched specimens of two different thicknesses, diagrams generated analytically from the plane-stress and plane-strain solutions of Bucci et al. as corrected for machine contribution to displacement, and from the uncorrected plane-stress solution which simulates well the load vs load-point-displacement behavior of the fatigue-precracked specimens. The J sub I sub c results obtained from these five calibrations are in substantial agreement with each other and with a known value of K sub I sub c for this material. Preliminary results from application of the deep-slot bend approximation are in accord with those determined from the compliance-type calibration procedures. (Author) GRA

N74-29996# Army Materials and Mechanics Research Center, Watertown, Mass.
STRESS CORROSION CRACKING SUSCEPTIBILITY OF BETA TITANIUM ALLOY 38-6-44: CANDIDATE ALLOY FOR SCOUT TORSION BAR Final Report
Walter F. Czyrklis and Milton Levy Apr. 1974 12 p refs
(DA Proj. 1T0-62105-A-328)
(AD-779414; AMMRC-TR-74-10) Avail: NTIS CSCL 11/6

The threshold stress itensities for stress corrosion crack propagation in beta titanium alloy 38-6-44, Ti-3Al-8V-6Cr-4Mo- 4Zr, has been determined in salt water and methanolic

solutions. The alloy was immune to stress corrosion cracking in aqueous sodium chloride solutions (marine environment). However, in methanolic solutions, the alloy was very susceptible to SCC. This marked susceptibility in methanolic solutions can be mitigated by the addition of sodium nitrate as an inhibitor. Crack extension in the alloy was transgranular and failure occurred by brittle quasicleavage in methanolic solutions. Author (GRA)

N74-29997# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCERNING THE QUESTION OF RAISING THE PROPERTIES OF SILUMINS
M. B. Altman, G. B. Stroganov, and N. S. Postnikov 17 Apr. 1974 17 p refs Transl. into ENGLISH from the book "Splavy Tsvetnykh Metallov" 1972 p 180-186
(AD-779639; FTD-HT-23-845-74) Avail: NTIS CSCL 11/6
The effects of the alloying element on the strength of aluminum alloys are examined for the case when the alloying element remains in solution (Al-Mg and Al-Cu systems), and for the case, when the alloying element forms second phases with independent forces (Al-Si systems). The mechanical strength of the Al Alloys with various additives are discussed. F.O.S.

N74-29998# British Steel Corp., Sheffield (England).
THE STRUCTURAL STATE OF AUSTENITE DURING CONTINUOUS HOT STRIP MILL ROLLING Information Services.
A. Jones and B. Walker Feb. 1974 27 p refs
(PB-230258/6; SM/612/A) Avail: NTIS HC $4.25 CSCL 11F
The structures and properties of hot-rolled steels which undergo an austenite to ferrite transformation can be markedly affected by the state of the austenite prior to transformation; particularly whether it is deformed or recrystallised. However, it is often difficult by conventional methods, e.g. metallography, to deduce directly from the room temperature ferrite, what was the state of prior austenite. This report describes a new method, based upon crystallographic textures, for making such deductions. GRA

N74-29999# Battelle Columbus Labs., Ohio.
OXIDATION AND HOT CORROSION OF Ni-Cr AND Co-Cr BASE ALLOYS CONTAINING RARE EARTH OXIDE DISPERSIONS Final Report, 6 Feb. 6973 - 5 Feb. 1974
Ian G. Wright, Ben A. Wilcox, and Robert I. Jaffee 11 Apr. 1974 109 p refs
(Contract N62269-73-C-0327)
(AD-779057) Avail: NTIS CSCL 11/6
The objectives of the program were to determine the effects of rare earth oxide dispersions on the oxidation and hot corrosion of Ni-Cr- and Co-Cr-base alloys, with emphasis on alumina scale-forming Co-base alloys. The results generated are intended to provide a better understanding of the compositional requirements of oxidation-resistant and hot corrosion-resistant superalloys for high-temperature service in severe environments. (Modified author abstract) GRA

N74-30000# Cincinnati Univ., Ohio. Dept. of Materials Science and Metallurgical Engineering.
BASIC MECHANISMS PROVIDING OXIDATION RESISTANCE IN STRUCTURAL METALS AT HIGH TEMPERATURES Final Report, 21 Dec. 1972 - 20 Dec. 1973
Casimir J. Rosa Jan. 1974 119 p refs
(Contract N62269-73-C-0520)
(AD-779065; NASC-0520-4) Avail: NTIS CSCL 11/6
Oxidation characteristics of Ti-4.32 wt. % Cb and Ti-4.37 wt. % Ta exposed to pure oxygen or air are reported for the temperature range 982-1200C. The oxidation kinetics can best be described by either an initial parabolic or cubic rate which is followed by consecutive parabolic relationships. It is shown that 64% and 75% of the total amount of oxygen is dissolved in the metal matrix of the Ti-4.37 Ta alloy and 58% and 63% dissolves in the matrix of the Ti-4.32 Cb alloy during oxidation at 1000 and 1200 C, respectively. X-ray diffraction studies reveal that the only oxide phases present are solid solutions of Ti Oz - BC2 O5 or Ti Oz - Ta 2 O5 formed during oxidation Temperature. Hardness profiles and oxidation rate constants were used to calculate the diffusion coefficient of oxygen in both alloys. Electromotive force measurements were made. (Modified Author Abstract) (GRA)

N74-29892* TRW Systems Group, Redondo Beach, Calif.
EXPERIMENT NO. M-577 IMMISCIBLE ALLOY COMPOSITIONS
J. L. Reger *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 133-158 refs (For availability see N74-29885 19-15)
CSCL 11F

N74-29893* Universite Catholique de Louvain (Belgium).
SILVER SAMPLES MELTED IN SPACE SKYLAB EXPERIMENT M565
A. Deruyttere, E. Aeronoudt, H. Goeminne, J. Smeesters, O. Arkens, and M. Verhaeghen *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 159-202 refs (For availability see N74-29885 19-15)
CSCL 11F

N74-29900* Howard Univ., Washington, D.C.
M558 RADIOACTIVE TRACER DIFFUSION
A. O. Ukanwa *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 425-456 refs (For availability see N74-29885 19-15)
CSCL 11F

N74-29901* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB EXPERIMENT M566 COPPER-ALUMINUM EUTECTIC
Earl A. Hasemeyer, Charles V. Lovoy, and L. L. Lacy *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 457-467 refs (For availability see N74-29885 19-15)
CSCL 11F

N74-29910* General Electric Co., Philadelphia, Pa.
ELECTROMAGNETIC CONTAINERLESS MELTING AND SOLIDIFICATION IN THE WEIGHTLESS ENVIRONMENT
R. T. Frost, E. H. Stockhoff, and G. Wouch *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 60 603-646 refs (For availability see N74-29905 19-15)
CSCL 11F

N74-29918* General Dynamics/Convair, San Diego, Calif.
LOW-GRAVITY DISPERSION OF SOLIDS IN LIQUID METALS
S. Kaye and J. Raat *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 14 Aug. 1974 p 857-885 refs (For availability see N74-29905 19-15)
(Contracts NAS8-27806; NAS8-29620)
CSCL 11F

N74-29922* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONCENTRATION CHANGES DURING EUTECTIC SOLIDIFICATION
Biliyar N. Bhat *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 953-961 refs (For availability see N74-29905 19-15)
CSCL 11F

N74-29925* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE ELECTRICAL PROPERTIES OF LOW-G PROCESSED IMMISCIBLE ALLOYS
G. H. Otto (Alabama Univ., Huntsville) and L. L. Lacy *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 June 1974 p 1030-44 refs (For availability see N74-29905 19-15)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-30001* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

METHOD OF REPAIRING DISCONTINUITY IN FIBERGLASS STRUCTURES Patent

Leonard L. Gelb (Hercules, Inc., Wilmington, Del.), William B. Helbert, Jr. (Hercules, Inc., Wilmington, Del.), Ronald B. Enie (Hercules, Inc., Wilmington, Del.), and Richard F. Mulliken, inventors (to NASA) Issued 4 Jun. 1974 4 p Filed 9 May 1972 Sponsored by NASA

(NASA-Case-LAR-10416-1; US-Patent-3,814,645; US-Patent-Appl-SN-251752; US-Patent-Class-156-94) Avail: US Patent Office CSCL 11D

Damaged fiberglass structures are repaired by substantially filling the irregular surfaced damaged area with a liquid, self-curing resin, preferably an epoxy resin mixed with choped fiberglass, and then applying to the resin surface the first of several woven fiberglass swatches which has stitching in a zig-zag pattern parallel to each of its edges and a fringe of warp and fill glass fibers about the edges outward of the stitching. The method is especially applicable to repair of fiberglass rocket engine casings and is particularly advantageous since it restores the repaired fiberglass structure to substantially its original strength without any significant changes in the geometry or mass of the structure. Official Gazette of the U.S. Patent Office

N74-30002*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

BORON/ALUMINUM-GRAPHITE/RESIN ADVANCED FIBER COMPOSITE HYBRIDS

C. C. Chamis, R. F. Lark, and T. L. Sullivan 1974 17 p refs Proposed for presentation at the Sixth Natl. Tech. Conf., Dayton, Ohio, 8-10 Oct. 1974; sponsored by the Society of Aerospace Material and Process Engineers

(NASA-TM-X-71580; E-8030) Avail: NTIS HC $3.00 CSCL 11D

An investigation was conducted to determine the fabrication feasibility and to assess the potential of adhesively-bonded metal and resin matrix fiber composite hybrids as an advanced material, for aerospace and other structural applications. The results of fabrication studies and of evaluation of physical and mechanical properties show that using this hybrid concept it is possible to design a composite which, when compared to nonhybrid composites, has improved transverse strength, transverse stiffness, and impact resistance with only a small penalty on density and longitudinal properties. The results also show that laminate theory is suitable for perdicting the structural response of such hybrids. The sequence of fracture modes indicates that these types of hybrids can be readily designed to meet fail-safe requirements. Author

N74-30003*# Boeing Aerospace Co., Huntsville, Ala. Nuclear and Space Physics Group.

FURTHER ANALYSIS OF FIELD EFFECTS ON LIQUIDS AND SOLIDIFICATION Final Report

R. F. Seiler, R. I. Miller, and W. S. Chen 9 Jul. 1974 88 p refs

(Contract NAS8-28664)

(NASA-CR-120313; D256-10024) Avail: NTIS HC $7.50 CSCL 11D

Numerical calculations of the magnitude of external field effects on liquids are presented to describe how external fields can influence the substructure of the field. Quantitative estimates of magnetic and gravitational effects are reported on melts of metals and semiconductors. The results are condensed in tables which contain the input data for calculation of the field effects on diffusion coefficient, solidification rate and for calculation of field forces on individual molecules in the melt. M.C.F.

N74-30004*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CERAMIC COATING FOR SILICA INSULATION Patent Application

Alexander Pechman (Lockheed Missiles and Space Co., Sunnyvale, Calif.) and Robert M. Beasley, inventors (to NASA) (Lockheed Missiles and Space Co., Sunnyvale, Calif.) Issued 24 Jun. 1974 16 p

(Contract NAS9-12137)

(NASA-Case-MSC-14270-2; US-Patent-Appl-SN-482105) Avail: NTIS HC $4.00 CSCL 11C

Lightweight, reusable, surface-insulating material for spacecraft has been developed. Since the low density, fibrous, refractory, silica insulations are quite porous and readily absorb moisture, it is necessary to coat the surfaces of such insulations with a coating which renders them impervious to moisture. A two-layered ceramic glaze coating for such silica insulations is described. NASA

N74-30005*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CERAMIC COATING FOR SILICA INSULATION Patent Application

Alexander Pechman (Lockheed Missiles and Space Co., Sunnyvale, Calif.) and Robert M. Beasley, inventors (to NASA) (Lockheed Missiles and Space Co., Sunnyvale, Calif.) Issued 24 Jun. 1974 17 p

(Contract NAS9-12137)

(NASA-Case-MSC-14270-1; US-Patent-Appl-SN-482104) Avail: NTIS HC $4.00 CSCL 11C

Low density, fibrous, rigid, silica insulations are rendered impervious to moisture by application of a ceramic glaze coating comprising a silica barrier layer, and an emissivity glaze layer comprising a high silica glass component, an emissivity agent, and a borosilicate glass component. The resulting ceramic glaze laminate adhered to the fibrous silica insulation provides a moisture-impervious insulating material which exhibits a high emissivity and is resistant to delamination and spalling at repeated cycles of thermal shock. NASA

N74-30006*# General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.

IMPROVED COATING FOR SILICA FIBER BASED CERAMIC REUSABLE SURFACE INSULATION (CRSI) Contractor Report, 1 Jul. - 31 Dec. 1973

Thomas J. Ormiston Apr. 1974 102 p refs

(Contract NAS3-17793)

(NASA-CR-134653) Avail: NTIS HC $8.25 CSCL 11D

A series of coatings was developed for the space shuttle type silica fiber insulation system and characterized for optical and physical properties. Reentry simulation tests were run using a radiant panel and also using a hypersonic plasma arc. The coatings produced had improved physical and optical properties as well as greater reuse capability over the GE version of the JSC-0042 coating. Author

N74-30007# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.

PIONEERING EXPERIMENTS ON THE COREDUCTION OF TITANIUM, ALUMINUM, AND VANADIUM CHLORIDES TO PRODUCE TITANIUM ALLOY SPONGE

Jack L. Henry, Wallace E. Anable, and John L. Schaller 1974 24 p refs

(BM-RI-7934) Avail: NTIS HC $4.25 CSCL 11D

Seven pioneering experiments in a 12-inch-diameter Kroll reduction reactor were conducted to examine the feasibility of coreducing the chlorides of Ti, Al, and V to produce a homogeneous titanium alloy sponge. The coreduction studies proceeded in a normal manner, and the yields of sponge were comparable with those of pure titanium sponge made in the same reactor. Vanadium concentration was very uniform throughout the sponge cake when VCl_4 in solution in $TiCl_4$ was fed into the molten magnesium. More difficulty was encountered in feeding solid VCl_2 and $AlCl_3$. Vanadium and aluminum concentration in the sponge was not uniform, and mechanical difficulties were experienced with the small-scale screw feeder. Although the sponge varied in composition from region to region, the ingots prepared from it were uniform in composition. Author

N74-30008*# Tulsa Univ., Okla.
RADIATIVE TRANSFER IN HIGHLY SCATTERING MATERIALS - NUMERICAL SOLUTION AND EVALUATION OF APPROXIMATE ANALYTIC SOLUTIONS
Kenneth C. Weston, Albert C. Reynolds, Jr., Arif Alikhan, and Daniel W. Drago [1974] 28 p refs
(Grant NGR-37-008-003)
(NASA-CR-139408) Avail: NTIS HC $4.50 CSCL 11D

Numerical solutions for radiative transport in a class of anisotropically scattering materials are presented. Conditions for convergence and divergence of the iterative method are given and supported by computed resutlts. The relation of two flux theories to the equation of radiative transfer for isotropic scattering is discussed. The adequacy of the two flux approach for the reflectance, radiative flux and radiative flux divergence of highly scattering media is evaluated with respect to solutions of the radiative transfer equation. Author

N74-30009# Army Coating and Chemical Lab., Aberdeen Proving Ground, Md.
A STUDY OF ELECTROSTATIC SPRAY APPLICATION OF POWDER COATINGS FOR POSSIBLE MILITARY USAGE Final Report
William H. Deaver Mar. 1974 10 p refs
(AD-777788; CCL-3013) Avail: NTIS HC $3.00 CSCL 11/3

Electrostatic spray application of powder coatings was studied for possible military usage. Commercial epoxy, polypropylene, polyester, acrylic and polyterephthalate materials were evaluated for physical properties such as flexibility, adhesion, resistance to water immersion, accelerated weathering and salt spray exposure. Some were found to be generally comparable to the comparison solvent type coatings. Author (GRA)

N74-30010# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATING THE THERMOPHYSICAL PROPERTIES OF HEAT-RESISTANT PYROCERAMIC COATING
B. N. Egorov, V. S. Kilesso, V. I. Kondratenkov, V. N. Levina, and V. V. Rostokinskii 16 Apr. 1974 10 p refs Transl. into ENGLISH from Tr. Akad. Nauk SSSR, Uralskii Filial, Inst. Khimii (Sverdlovsk), no. 5, 1972 p 339-342
(AD-778590; FTD-HT-23-1308-74) Avail: NTIS CSCL 11/3

Investigations of heat capacity and heat conductivity which were conducted showed that by means of the appropriate heat treatment of glasses it is possible to obtain heat-resistant pyroceramic coatings which possess increased heat conductivity. In this regard, in constrast to heat conductivity the amount of heat capacity is determined by the chemical composition and is virtually independent of the degree of crystallization. The obtained data permit conducting a thermal calculation of various designs which operate under constant or variable heat conditions with the feeding or release of heat GRA

N74-30011# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
ANALYTIC MODELING OF LAMINAR COMPOSITES WITH APPLICATION TO THROUGH-CRACK PROBLEMS Annual Report, Jul. 1972 - Jun. 1973
P. D. Hilton, G. C. Sih, and R. Badaliance Dec. 1973 69 p refs
(Contract F33615-71-C-1429; AF Proj. 7340)
(AD-779636; IFSM-73-53; AFML-TR-10-112-Pt-4; AR-4) Avail: NTIS CSCL 11/4

The variational principle of minimum complementary potential energy is employed to develop an approximate three-dimensional model for the stress distribution in laminar composites. This approximate theory is applied to the problem of a symmetric composite plate containing a through crack subjected to in-plane loading. Asymptotic solutions are obtained for the stress components in the vicinity of the leading crack edge. These solutions are in complete agreement with information obtained from an exact three-dimensional asymptotic analysis; i.e., the in-plane variation of the stress components within each layer is described by the singular portion of the elastic, plane strain crack solution. However, because of the three-dimensional character of the problem, the amplitude of the singular solution for the stress components varies along the leading crack edge. A two-parameter model incorporating the concept of surface and interfacial boundary layers is used to describe this transverse variation. (Modified author abstract) GRA

N74-30012# Cabot Corp., Billerica, Mass.
INVESTIGATION OF BORON CARBIDE RIBBON-REINFORCED TITANIUM COMPOSITES Final Report, 3 Feb. 1973 - 2 Feb. 1974
Monroe J. Hordon 29 Mar. 1974 55 p refs
(Contracts N62269-73-C-0306; N00019-72-C-0445)
(AD-779058; Rept-74-CO-2) Avail: NTIS CSCL 11/4

Boron carbide ribbon-reinforced titanium composites were fabricated by a masked deposition and lamination process. B4C content was varied in the range 20 - 40 percent, and the ribbon width/thickness (w/t) ratio was varied from 120 - 2000. Matrix alloys investigated included un-alloyed Ti A55 and Ti-6Al-4V. The mechanical behavior was examined in the temperature range 70F - 900F. Tensile strength and modulus increased with B4C content, and decreased with temperature. Effective mechanical isotropy was achieved for composites containing uniaxially aligned ribbons with a w/t radio =325. Author (GRA)

N74-30013# LTV Aerospace Corp., Dallas, Tex. Vought Systems Div.
S-3A GRAPHITE/EPOXY SPOILER DEVELOPMENT PROGRAM Interim Technical Report, 29 Jun. - 31 Dec. 1973
Jan. 1974 166 p
(Contract N62269-73-C-0610)
(AD-779069; Rept-2-53443/3R-3139; ITR-1) Avail: NTIS CSCL 11/4

Material selection, structural analysis, manufacturing and tool development and verification testing results are presented for an S-3A graphite spoiler. The spoiler is designed to be a cost competitive lightweight replacement for the metal spoiler, and is to be fit and functionally interchangeable with the existing part. The spoiler will be of sandwich construction with graphite/epoxy faces and non-metallic core. Narmco 5209/T300 graphite/epoxy tape material which has a 260F curing temperature was selected for the skins and fiberglass (HRP) core will be used. Problems encountered during the fabrication of 12 manufacturing development specimens and 118 design verification specimens are outlined and solutions explained. A manufacturing operational sequence describes the major fabrication operations. Design verification testing resulted in a design modification to the spoiler because of loss of strength and stiffness when the sandwich specimens were co-cured. Detail assembly drawings are included. GRA

N74-30014# Raytheon Co., Waltham, Mass. Research Div.
CHEMICAL VAPOR DEPOSITION DENSIFICATION OF 3-D PREFORMS Final Report, 26 Jun. 1972 - 26 Dec. 1973
A. J. Capriulo, J. Pappis, and R. N. Donadio Apr. 1974 13 p
(Contract DAAG46-72-C-0243; DA Proj. 1W1-62113-A-661)
(AD-779475; AMMRC-CTR-74-21) Avail: NTIS CSCL 11/4

Graphitic materials have been considered to be among the prime candidates for use as nose tips on advanced interceptors. Carbon/carbon composites to be useful engineering materials must be densified after they are woven. The approach used in this program was to densify 3-D carbon/carbon composites by a chemical vapor deposition process after the composites had been initially rigidized with pitch or resin. In the report the densification procedures used, summary of results, and preliminary conclusions are reported. GRA

N74-30015# Duke Univ., Durham, N.C. Dept. of Civil Engineering.
PLASTICITY THEORY OF FIBROUS COMPOSITES, PART 1 Interim Technical Report
George J. Dvorak and M. S. Madhava Rao Dec. 1973 38 p refs
(Grant DA-ARO(D)-31-124-71-G103)
(AD-779480; Solid-Mechanics-Ser-8; AROD-9570-3-E; ITR-3) Avail: NTIS CSCL 11/4

This is the first of a three-part study on plastic deformation of unidirectional fibrous composites which are made of isotropic, linearly elastic fibers, and an elastic-plastic, nonhardening matrix of the Mises type. It is shown that the composite experiences kinematic hardening when loaded by axisymmetric composite stresses. A simple Hardening Rule I is derived, and an associated

flow rule is formulated. The results obtained from these rules are verified by comparison with exact, finite element plasticity solutions for a cylindrical composite model of the B-Al system. A very good agreement is obtained both for proportional and general loading regimes. Significant plastic macrodilatation, which is caused by elastic but not completely reversible deformation of the constituents, was found for certain loading directions in the axisymmetric composite stress plane. (Modified author abstract) GRA

N74-30016# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE REALIZATION OF MECHANICAL PROPERTIES OF FIBERS IN HIGH-MODULUS POLYMER COMPOSITES
G. M. Gunyaev 8 Apr. 1974 10 p refs Transl. into ENGLISH from Mekh. Polim. (USSR), no. 6, 1972 p 1123-1125
(FTD Proj. T73-01-11; FTD Proj. T74-01-43)
(AD-779277; FTD-HT-23-1323-74) Avail: NTIS CSCL 11/4

This report briefly examines the effect of scattering of the strength and deformation properties of high-modulus fibers, the degree of twist, the presence of pores in the polymer matrix on the degree of realization of the potential possibilities of these fibers in composite materials. Author (GRA)

N74-30017# General Motors Corp., Indianapolis, Ind. Diesel Allison Div.
OPTIMIZATION AND DESIGN CRITERIA FOR BERYLLIUM/TITANIUM COMPOSITES Interim Report, 1 Nov. 1973 - 31 Jan. 1974
G. R. Sipppel and M. Herman Mar. 1974 24 p
(Contract N00019-74-C-0103)
(AD-779627; EDR-8159) Avail: NTIS CSCL 11/4

A program plan for evaluating beryllium/titanium composite materials with respect to method of manufacture, v/o Be extrusion and forging reduction is presented. Coextruded Be/Ti powders, as well as coextruded Be rod with a wrought Ti matrix will be investigated. The most cost effective material/process will be fully characterized and design criteria properties determined for gas turbine fan/compressor blades applications. Author (GRA)

N74-30018# General Electric Co., Schenectady, N.Y. Corporate Research and Development.
INVESTIGATION OF CERAMICS FOR HIGH-TEMPERATURE TURBINE VANES Final Report, 20 Mar. - 19 Dec. 1973
Svante Prochazka and Peter C. Smith Apr. 1974 77 p refs
(Contract N62269-73-C-0356)
(AD-779053; GE-SRD-74-040) Avail: NTIS CSCL 11/2

Large tubular crystals of alpha-SiC, which can become strength limiting, tend to grow during the hot-pressing boron containing beta-SiC powder. The exaggerated grain growth was controlled by several methods: Stabilization of beta-SiC by nitrogen; nucleation of alpha-SiC by seeding, and, decreasing the hot-pressing temperature by using SiC powders with increased sinterability. Nitrogen doping was achieved by the addition of either Si3N4 or BN and yields electrically conductive materials which are amenable to electro discharge machining. The hot-pressing of large billets of nitrogen-doped materials revealed that specimen thickness and the applied pressure are critical parameters which affect the final density. Pressure-less sintering was achieved in submicron beta-SiC powders by the addition of boron and carbon. Results of microstructural examination, room temperature and high temperature bend strength, creep and impact tests are presented. (Modified author abstract) GRA

N74-30019# Duke Univ., Durham, N.C. Dept. of Civil Engineering.
PLASTICITY THEORY OF FIBROUS COMPOSITES, PART 2 Interim Technical Report
M. S. Madhava Rao and George J. Dvorak Dec. 1973 43 p refs
(Contract DA-31-124-ARO(D)-71-G103)
(AD-779481; Solid-Mechanics-Ser-9-Pt-2; AROD-9570-4-E; ITR-4) Avail: NTIS CSCL 11/4

This is the second of a three-part study of the plastic deformation of unidirectional fibrous composites made of isotropic, linearly elastic fibers, and an elastic-plastic, nonhardening matrix of the Mises type. The results obtained in the first part for the case of axisymmetric loading of the composite are extended and refined. A new kinematic Hardening Rule II is derived, and an associated flow rule is formulated. An approximate method for the evaluation of the microstresses in the composite is described. The theory is verified by comparison with exact, finite element plasticity solutions for a composite cylinder model of the Be-Al, and B-Al systems. The agreement between the approximate and exact results is very satisfactory. Author (GRA)

N74-30020# Dayton Univ. Research Inst., Ohio.
ENVIRONMENTAL AGING OF CANDIDATE FIRE SUPPRESSANT DRY BAY AREA MATERIALS FOR AIRCRAFT
Philip A. House and William E. Berner Dec. 1973 88 p
(Contract F33615-72-C-1282; AF Proj. 7381)
(AD-779676; AFML-TR-73-283) Avail: NTIS CSCL 11/9

Information is needed on the environmental aging of various candidate fire suppressant dry bay materials. This includes resistance to water, fuel, lubricating oil, hydraulic fluid, and heat. Three rigid materials, (a polyurethane, a polyisocyanurate, and a polyimide foam) and five flexible materials, (two polyester mattings and three polyether polyurethane foams) were subjected to environmental testing. The best rigid material and the best flexible material for this purpose are identified. (Modified author abstract) GRA

N74-29894* National Research Inst. for Metals, Tokyo (Japan).
PREPARATION OF SILICON CARBIDE WHISKER REINFORCED SILVER COMPOSITE MATERIAL IN A WEIGHTLESS ENVIRONMENT, SKYLAB EXPERIMENT M561
Tomoyoski Kawada, Sennosuke Takahaski, Susumu Yoshida, Eiichi Ozaqa, and Renpei Yoda *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 203-233 refs (For availability see N74-29885 19-15)
CSCL 11D

N74-29902* California Univ., Los Angeles.
HALIDE EUTECTIC GROWTH
A. S. Yue and J. G. Yu *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 469-489 refs (For availability see N74-29885 19-15)
CSCL 11D

N74-29919* Rockwell International Corp., Downey, Calif.
OXIDE GLASS PROCESSING IN SPACE
R. A. Happe and L. E. Topol *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 887-923 refs (For availability see N74-29905 19-15)
(Contracts NAS8-28014; NAS8-28991)
CSCL 11D

N74-29920* IIT Research Inst., Chicago, Ill.
SPACE PROCESSING OF CHALCOGENIDE GLASSES
D. C. Larsen, M. A. Ali, and W. B. Crandall *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 925-938 (For availability see N74-29905 19-15)
CSCL 11D

N74-29921* United Aircraft Corp., East Hartford, Conn. Research Labs.
EUTECTIC SOLIDIFICATION
F. C. Douglas and F. S. Galasso *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 939-952 refs (For availability see N74-29905 19-15)
CSCL 11D

N74-29924* Battelle Columbus Labs., Ohio.
IMMISCIBLE MATERIALS AND ALLOYS
A. J. Markworth, S. H. Gelles, J. J. Duga (Mater. Res. and Computer Simulation), and W. Oldfield *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 1003-1029 refs (For availability see N74-29905 19-15)
CSCL 11D

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-30021*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE AUTO AND CROSS CORRELATION OF PN SEQUENCES
James C. Morakis Dec. 1969 48 p refs
(NASA-TM-X-70699; X-520-69-527) Avail: NTIS HC $5.50 CSCL 12A

The autocorrelation and crosscorrelation properties of pseudorandom (PN) sequences are analyzed by using some important properties of PN sequences. These properties make this discussion understandable without the need of linear algebraic approach. The analysis is followed by some experimental results. Author

N74-30022# National Bureau of Standards, Boulder, Colo.
TABLES OF COLLISION INTEGRALS AND SECOND VIRIAL COEFFICIENTS FOR THE (m,6,8) INTERMOLECULAR POTENTIAL FUNCTION
Max Klein, H. J. M. Hanley, Francis J. Smith (Queen's Univ.), and Paul Holland Jun. 1974 157 p refs
(NSRDS-NBS-47; LC-73-600059) Avail: SOD HC $1.90 as C13.48:47

Tables of collision integrals and second virial coefficients are presented for the (m,6,8) potential function. Ten values of the repulsive exponent m are included which range in unit steps from m = 9 through m = 18. Approximately 6 values of the parameter, gamma, associated with the inverse eighth power term, are included for each value of m. These tables are equivalent, therefore, to tables for 60 three-parameter (m,6) potential functions. Comparisons of our results from m = 12 and gamma = 0 (corresponding to the (12,6) function) were made with other calculations. Based on these comparisons, the accuracy of the calculation appears to be at least two or three parts in 10,000 depending on the temperature. A table is included which contains the Boyle temperature, the Boyle volume, and the ratio of the intermolecular separation at the potential minimum to the separation at the zero of the potential. Author

N74-30023# Technische Hochschule, Darmstadt (West Germany).
INTERSECTION POINT PROPERTIES OF LEVEL LINE FAMILIES Ph.D. Thesis [SCHNITTPUNKTEIGENSCHAFTEN EBENER GERADEN FAMILIEN]
Volker Douglas 1973 62 p refs In GERMAN
Avail: NTIS HC $6.25

Closed steady planar line families and their envelopes are considered in determining how many lines go through a given intersecting point. It is shown that the envelope of a line family dissects a plane in such a way that the same amount of lines from one family passes through all points that belong to a common region. Transl. by G.G.

N74-30024# Toulouse Univ. (France).
CONTRIBUTION OF THE NOTION OF BOOLEAN DIFFERENCE AND ITS APPLICATION TO DIAGNOSTIC LOGIC Ph.D. Thesis [CONTRIBUTION A L'ETUDE DE LANOTION DE DIFFERENCE BOOLEENNE ET A SES APPLICATIONS AU DIAGNOSTIC LOGIQUE]
Jean Erceau 1973 171 p refs In FRENCH
Avail: NTIS HC $11.75

Several theorems and Boolean difference procedures used to detect faults in logic, combinational logic, and sequential circuits are introduced. A diagostic computer program DIALOD is included for testing sequence methods and diagnosing faults in multiple combination logic circuits. Transl. by E.H.W.

N74-30025# Toulouse Univ. (France).
CONTRIBUTION OF THE MINIMIZATION OF LOGIC FUNCTIONS Ph.D. Thesis [CONTRIBUTION A LA MINIMISATION DES FONCTIONS LOGIQUES]
Jean-Claude Torque 1973 152 p refs In FRENCH
Avail: NTIS HC $10.75

Boolean functions and their use in the synthesis of combinational logic, sequential, and switching circuits were analyzed. Different methods used to determine prime implicants of the switching function and computer algorithms used to simplify Boolean and switching functions were included. Transl. by E.H.W.

N74-30026# Toulouse Univ. (France).
DYNAMIC OPTIMIZATION FOR QUASILINEARIZATION AND HIERARCHY COMMAND Ph.D. Thesis [OPTIMISATION DYNAMIQUE PAR QUASILINEARISATION ET COMMANDE HIERARCHISEE]
Jean Galy 1973 141 p refs In FRENCH
Avail: NTIS HC $10.25

A numerical study was made of the optimal control of dynamic nonlinear systems utilizing hierachy control and two precise linear structures. Two problems were considered: (1) integration of differential nonlinear systems with boundary conditions, and (2) extension at the hierarchy control method to the case of coupling in the variable state. Transl. by E.H.W.

N74-30027*# Massachusetts Inst. of Tech., Cambridge. Decision and Control Sciences Group.
OPTIMAL COMPENSATOR STRUCTURE FOR LINEAR TIME-INVARIANT PLANT WITH INACCESSIBLE STATES M.S. Thesis
Patrick Jean-Pierre Blanvillain May 1974 115 p refs
(Grant NGL-22-009-124; MIT OSP Proj. 76265)
(NASA-CR-138304; ESL-R-546) Avail: NTIS HC $8.75 CSCL 12A

The problem is considered of designing an optimal linear time-invariant dynamic compensator for the regulation of an n-th order linear time-invariant plant with m independent outputs. The initial plant state is characterized by its first and second moments, and the cost is usual quadratic infinite-time penalty on the state and control, averaged over the initial plant and compensator states. The compensator is based on a minimal-order Luenberger observer and consequently has fixed dimension n-m. Necessary and sufficient conditions are derived for optimality of the compensator gains. The optimal compensator is shown to be unique if the plant has a particular canonical form, and, in general, for any arbitrary plant, the class of all optimal compensators is precisely determined. Author

N74-30028*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.
TIME-DEPENDENT PERTURBATION OF A TWO-STATE QUANTUM MECHANICAL SYSTEM
David Roger Dion 7 Jun. 1974 341 p refs
(Grants NGL-50-002-00; NSF GP-28213)
(NASA-CR-139250; WIS-TCI-502) Avail: NTIS HC $20.25 CSCL 12A

A two- (nondegenerate) level quantum system interacting with a classical monochromatic radiation field is described. The existing work on this problem is reviewed and some novel aspects of the problems are presented. Author

N74-30029# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE CONTROL OF A SIMPLE INERTIA M.S. Thesis
John Travis Williams Dec. 1973 145 p refs
(AD-777876; GE/EE/73-33) Avail: NTIS CSCL 12/1

Three types of controllers were developed in this thesis for use with a position-control system which was characterized by a second-order differential equation. One type of controller was linear and continuous. Both examples of this type of controller were each optimal in the sense that they were designed to minimize a specific performance index. The other types were optimal nonlinear on/off controllers, and a linear on/off controller with an optimal slope for its switching line. Theory is presented in detail for the development of the linear on/off controller with optimal slope of its switching line. (Modified author abstract) GRA

N74-30030# Arizona Univ., Tucson. Dept. of Mathematics.
CHEAP CONTROL OF THE TIME-INVARIANT REGULATOR

Robert E. OMalley, Jr. and Antony Jameson 20 May 1974 42 p refs Prepared in cooperation with New York Univ., N. Y. (Contracts N00014-67-0209-0022; AT(11-1)-3077; NR Proj. 041-466)
(AD-779336) Avail: NTIS CSCL 12/1

The asymptotic solution of the linear quadratic state regulator problem is obtained as the cost of the control tends to zero. Matrix Riccati gains are obtained via singular perturbations theory and are used to asymptotically calculate the optimal control and the corresponding trajectories. Several cases are distinguished and applications are discussed. Author (GRA)

N74-30031# Michigan Univ., Ann Arbor. Systems Engineering Lab.
SENSITIVITY ANALYSIS IN MULTILINEAR SYSTEMS
William A. Porter and Romano M. DeSantis Dec. 1973 41 p refs
(Grant AF-AFOSR-2427-73; AF Proj. 9749)
(AD-779732; UMICH-011321-6-T; SEL-TR-77; AFOSR-74-0633TR) Avail: NTIS CSCL 12/1

The primary objective of this study is to examine the sensitivity properties of a multilinear plant embedded in a feedback structure. As a prelude the existing linear theory is summarized and extended. The bilinear case is then treated in detail. Extrapolation to the multilinear case is carried out in Appendix B. New results include the following. (1) the use of causality structure as a component of sensitivity analysis in closed loop linear and nonlinear systems, (2) the establishment of terminal equivalence conditions for multilinear plants and multilinear compensators, (3) the development of a sensitivity operator in the multilinear setting including existence conditions, (4) extensions of linear results to large parameter perturbations. Author (GRA)

N74-29822* Kanner (Leo) Associates, Redwood City, Calif.
THE ROLE OF STATISTICAL MEASUREMENTS IN EXPERIMENTAL RESEARCH
V. V. Olshevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 123-126 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 115-117 (For availability see N74-29785 19-15)
CSCL 12A

N74-29823* Kanner (Leo) Associates, Redwood City, Calif.
INTERPRETATION OF THE RESULTS OF STATISTICAL MEASUREMENTS
V. V. Olshevskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 127-130 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 118-120 (For availability see N74-29785 19-15)
CSCL 12A

N74-29824* Kanner (Leo) Associates, Redwood City, Calif.
LP-SEARCH AND ITS USE IN ANALYSIS OF THE ACCURACY OF CONTROL SYSTEMS WITH ACOUSTICAL MODELS
V. I. Sergeyev, I. M. Sobol, R. B. Statnikov, and I. N. Statnikov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 131-133 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 121-123 (For availability see N74-29785 19-15)
CSCL 12A

N74-29825* Kanner (Leo) Associates, Redwood City, Calif.
ALGORITHM FOR IDENTIFICATION OF A SINGLE CLASS
V. A. Kaminskas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 134-138 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 124-126 (For availability see N74-29785 19-15)
CSCL 12A

N74-29827* Kanner (Leo) Associates, Redwood City, Calif.
SYNTHESIS OF AN OBSERVATION OPERATION AND THE PROPERTY OF COMPLETE OBSERVABILITY OF NONLINEAR OBJECTS
Ye. A. Galperin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 142-144 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 129-130 (For availability see N74-29785 19-15)
CSCL 12A

N74-29832* Kanner (Leo) Associates, Redwood City, Calif.
A USE OF REGRESSION ANALYSIS IN ACOUSTICAL DIAGNOSTICS OF GEAR DRIVES
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, A. A. Kobrinskiy, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 160-162 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 145-146 (For availability see N74-29785 19-15)
CSCL 12A

N74-29839* Kanner (Leo) Associates, Redwood City, Calif.
SELECTION OF INFORMATIVE PARAMETERS OF VIBROACOUSTIC PROCESSES
L. N. Koshek *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 181-184 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 162-164 (For availability see N74-29785 19-15)
CSCL 12A

N74-29840* Kanner (Leo) Associates, Redwood City, Calif.
DIGITAL METHODS OF EXTRACTING SPECTRAL CHARACTERISTICS IN A TRANSIENT SIGNAL
V. K. Maslov and G. A. Rozenberg *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 185-187 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 165-167 (For availability see N74-29785 19-15)
CSCL 12A

N74-29845* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF APPROXIMATE DETERMINATION OF THE CHARACTERISTICS OF NONLINEAR VIBRATIONAL SYSTEMS
R. P. Atstupenene and V.-R. V. Atstupenas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 197-203 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostik Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 175-179 (For availability see N74-29785 19-15)
CSCL 12A

N74-29873* Kanner (Leo) Associates, Redwood City, Calif.
NEW METHODS OF FRAGMENTARY APPROXIMATION OF A FUNCTION
S. G. Kolesnichenko and A. A. Maslov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 311-313 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 278-279 (For availability see N74-29785 19-15)
CSCL 12A

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-30032 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA. VOLUME 136, NO. 2: AEROLOGICAL DATA AT BERLIN TEMPELHOF, APRIL - JUNE 1973 [METEOROLOGISCHE ABHANDLUNGEN. BAND 136, HEFT 2: AEROLOGISCHE DATEN BERLIN-TEMPELHOP, APRIL - JUNI 1973]
1973 230 p refs
Avail: Issuing Activity

The detailed results of radiosonde and ozone-sonde ascents are presented in tabular and graphical form. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound, were extracted for all standard pressure surfaces, several height levels, the tropopause and the freezing level. Author

N74-30033 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 135, NO. 8: RESULTS OF THE SYNOPTIC SERVICE DURING 1973. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, AUGUST [METEOROLOGISCHE ABHANDLUNGEN. BAND 135, HEFT 8: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1973. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 MB), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, AUGUST]
1973 204 p refs In GERMAN
Avail: Issuing Activity

Daily and monthly Northern Hemisphere ground level and 500 mb height and temperature analyses of constant pressure level for August 1973 are presented. Included scientific studies cover aspects of synoptic climatology over the Berlin sector and data on atmospheric radioactivity and dust content.
Transl. by G.G.

N74-30034 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 139, NO. 3: THE EUROPEAN CLIMATOLOGY METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 3, 3RD QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT 3: DAS EUROPAEISCHE WETTERBILD 1973 WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 3, 3. VIERTELJAHR]
1973 198 p refs In GERMAN
Avail: Issuing Activity

The present volume continues the daily European weather maps for the 3rd quarter in 1973. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer. Transl. by G.G.

N74-30035 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 130, NO. 5: AEROLOGICAL DATA AT BERLIN TEMPELHOF, OCTOBER - DECEMBER 1972 [METEOROLOGISCHE ABHANDLUNGEN. BAND 130, HEFT 5: AEROLOGISCHE DATEN BERLIN-TEMPELHOF, OKTOBER - DEZEMBER 1972]
1973 289 p refs In GERMAN
Avail: Issuing Activity

The detailed results of the radiosonde and ozone sonde acents performed by the aerological station of the Institut for Meteorologie at the free University Berlin are presented in tabular and graphical form. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound, were extracted pressure surfaces, several height levels, the tropopause and the freezing level. Author

N74-30036 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 119, NO. 3: METEOROLOGICAL SATELLITE OBSERVATIONS AND THEIR EVALUATION. THE EUROPEAN CLIMATOLOGY, 1970, PART 3 [METEOROLOGISCHE ABHANDLUNGEN. BAND 119, HEFT 3: WETTERSATELLITENBEOBACHTUNGEN UND IHRE AUSWERTUNG DAS EUROPAEISCHE WETTERBILD 1970, TEIL 3, 3. VIERTELJAHR]
1971 245 p refs In GERMAN
Avail: Issuing Activity

The eruption of the volcano on Jan Mayen Island, Norway on September 22, 1970 is discussed. Cloud photographs from the weather satellites ESSA 8 and ITOS 1 taken within a time difference of about six hours are compared. Additional information given includes the following: (1) a supplement to the WEFAX experiment of ATS 3; (2) a collection of daily climatological data for Europe for the period July through September 1970; and (3) orbital data from the ESSA 8 and ITOS 1 flights.
Author

N74-30037 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 135, NO. 9: RESULTS OF THE SYNOPTIC SERVICE DURING 1973. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES, SEPTEMBER [METEOROLOGISCHE ABHANDLUNGEN. BAND 135, HEFT 9: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1973. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 MB), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, SEPTEMBER]
1973 178 p refs In GERMAN
Avail: Issuing Activity

Daily and monthly Northern Hemisphere ground level and 500 mb height and temperature analyses of constant pressure levels for September 1973 are presented. Included scientific studies cover aspects of synoptic climatology over the Berlin sector, data on atmospheric radioactivity and dust content, and daily, monthly, and yearly precipitation measurements from April 1908. Transl. by G.G.

N74-30038 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 140, NO. 2: THE DISTRIBUTION OF LOCAL RAINFALLS IN WEST BERLIN [METEOROLOGISCHE ABHANDLUNGEN. BAND 140, HEFT 2: DIE VERTEILUNG LOKALER REGENFAELLE IM WESTBERLIN STADTGEBIET]
Bernhard Lindenbein and Horst Malberg 1973 67 p refs In GERMAN
Avail: Issuing Activity

Precipitation, especially in form of heavy rain, is an essential synoptic parameter that makes it possible to draw conclusions about local forecasts of precipitation. This investigation is based on continuous registrations from 13 stations, for which the daily records were evaluated for the months of April-October for 20-25 years. Three groups are distinguished: rain greater or equal to 5 mm, intensive rain, and extreme rain. The results include statements about frequency, intensity, duration and amount of precipitation, occurance of rain events on time etc. In this context it is important to consider the distribution of the individual parameters in the area of West Berlin. As the discussion of rain greater or equal to 5 mm shows, there exists a pronounced division into 3 regimes in the westeast direction. The division is confirmed by the distribution of intensive rain. Regarding the diurnal variation of intensive rain there are also evident differences between the center and the outlying parts of the city. For the local weather forecast it is of importance to know the synoptic situations during which intensive rainfalls occur. It appears, that they take place specially in connection with cold fronts, cold front waves, high level cyclones and troughs. Author

N74-30039 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLGICAL DATA. VOLUME 135, NO. 11: RESULTS OF THE SYNOPTIC SERVICE DURING 1973. DAILY AND MONTHLY WEATHER MAPS (GROUND, 500 mb), TABLES AND BRIEF SCIENTIFIC ARTICLES NOVEMBER [METEOROLOGISCHE ABHANDLUNGEN. BAND 135, HEFT 11: ERGEBNISSE DES SYNOPTISCHEN DIENSTES IM JAHRE 1973. TAEGLICHE UND MONATLICHE WETTERKARTEN (BODEN, 500 MB), TABELLEN UND KLEINERE WISSENSCHAFTLICHE AUFSAETZE, NOVEMBER]
1973 206 p refs In GERMAN
Avail: Issuing Activity

Daily and monthly Northern Hemisphere ground level and 500 mb height and temperature analyses of constant pressure levels for November 1973 are presented. Included scientific studies cover aspects of synoptic climatology over the Berlin sector and data on atmospheric radioactivity and dust content.
Transl. by G.G.

N74-30040 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 132, NO. 2: DAILY ALTITUDE MAPS OF THE 30 mb LEVEL AND MONTHLY MEAN MAPS FOR 1972, PARTS 3 AND 4 [METEOROLOGISCHE ABHANDLUNGEN. BAND 132, HEFT 2: TAEGLICHE HOEHENKARTEN DER 30-MB-FLAECHE SOWIE MONATLICHE MITTELKARTEN FUER DAS JAHR 1972, TEIL 3 UND 4, 3 UND 4 VIERTELJAHR]
1973 250 p refs In GERMAN
Avail: Issuing Activity

The present volume continues the series of stratospheric weather maps. It contains daily height and temperature analysis of constant pressure levels for 6 months for the whole of the Northern Hemisphere, based on rawinsonde data and performed with the aid of a hydrostatic build-up method. The corresponding monthly mean maps, their variations and deviations are included as well as the mean gridpoint data, calculated from daily values. Moreover, the stratospheric circulation of polar, middle, and tropical latitudes is described for the period under consideration.
Author

N74-30041 Freie Univ., Berlin (West Germany).
METEOROLOGICAL DATA. VOLUME 139, NO. 2: THE EUROPEAN CLIMATOLOGY 1973. METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 2, 2nd QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT 2: DAS EUROPAEISCHE WETTERBILD 1973. WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 2, 2 VIERTELJAHR]
1973 191 p In GERMAN
Avail: Issuing Activity

The present volume continues the daily European weather maps for the 2nd quarter of 1973. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer.
Transl. by G.G.

N74-30042 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 130, NO. 4: AEROLOGICAL DATA AT BERLIN TEMPELHOF, JULY - SEPTEMBER 1972 [METEOROLOGISCHE ABHANDLUNGEN. BAND 130, HEFT 4: AEROLOGISCHE DATEN BERLIN-TEMPELHOF, JUL. - SEPTEMBER 1972]
1973 284 p refs In GERMAN
Avail: Issuing Activity

The detailed results of radiosonde and ozone-sonde ascents are presented in tabular and graphical form. Extreme and mean values of the temperature, pressure, geopotential, wind data, refractivity, pseudopotential temperature and velocity of sound, were extracted for all standard pressure surfaces, several height levels, the tropopause and the freezing level.
Author

N74-30043 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 118, NO. 3: DAILY AND MONTHLY NORTHERN HEMISPHERE 10-MILLIBAR-SYNOPTIC WEATHER MAPS OF THE YEAR 1970. PART 3: JULY-SEPTEMBER [METEOROLOGISCHE ABHANDLUNGEN. BAND 118, HEFT 3]
1972 127 p refs
(Contract DAJA37-72-C-3073)
(QTSR-3) Avail: Issuing Activity

Daily height and temperature analysis of constant pressure levels for three months are given for the whole of the Northern Hemisphere, based on rawinsonde and rocketsonde data and performed with the aid of a hydrostatic build-up method. The corresponding monthly mean maps, their variations and deviations are included as well as the mean gridpoint data, calculated from daily values. The stratospheric circulation of polar, middle, and tropical latitudes is also described for the period under consideration.
Author

N74-30044 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 131, NO. 2: DAILY ALTITUDE MAPS OF THE 50 mb LEVEL AND MONTHLY MEAN MAPS FOR 1972, PARTS 3 AND 4 [METEOROLOGISCHE ABHANDLUNGEN. BAND 131, HEFT. 2: TAEGLICHE HOEHENKARTEN DER 50-MB-FLAECHE SOWIE MONATLICHE MITTELKARTEN FUER DAS JAHR 1972, TEIL 3 UND 4, 3. UND 4. VIERTELJAHR]
1973 255 p refs In GERMAN
Avail: Issuing Activity
For abstract, see N74-30043.

N74-30045 Freie Univ., Berlin (West Germany). Inst. for Meteorology.
METEOROLOGICAL DATA. VOLUME 136, NO. 1: AEROLOGICAL DATA AT BERLIN TEMPELHOF, JANUARY - MARCH 1973 [METEOROLOGISCHE ABHANDLUNGEN. BAND 136, HEFT 1: AEROLOGISCHE DATEN BERLIN-TEMPELHOF, JANUAR - MAERZ 1973]
1973 285 p refs In GERMAN
Avail: Issuing Activity
For abstract, see N74-30042.

N74-30046 Michigan Univ., Ann Arbor.
ON THE SIMULATION OF THE AXISYMMETRIC CIRCULATION OF THE ATMOSPHERE Ph.D. Thesis
Humberto Adrian Fuenzalida 1973 207 p
Avail: Univ. Microfilms Order No. 74-15725

The governing equations of a two-layer quasi-geostrophic model are cast in terms of potential vorticities and zonally averaged. Using suitable boundary conditions at the pole and equator they are integrated in time for three years. The thermal forcing is provided by an ad hoc diabatic heating function which includes radiative fluxes, latent heat released by condensation, turbulent transport in the boundary layer and thermal interaction with the oceans. The poleward eddy fluxes of sensible heat and angular momentum are parameterized first by means of diagnostically determined exchange coefficients for heat and potential vorticity, which depend on latitude and pressure, but do not vary in time. The integration results include the temperature field at 100 and 50 cb, the zonal flow at 75 and 25 cb, and the vertical motion at 50 cb, all of which are evaluated every third day.
Dissert. Abstr.

N74-30047*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SURFACE ATMOSPHERIC EXTREMES (LAUNCH AND TRANSPORTATION AREAS)
Jun. 1974 77 p refs
(NASA-SP-8084) Avail: NTIS HC $4.00 CSCL 04B

Criteria are provided on atmospheric extremes from the surface to 150 meters for geographical locations of interest to NASA. Thermal parameters (temperature and solar radiation), humidity, precipitation, pressure, and atmospheric electricity (lightning and static) are presented. Available data are also provided for the entire continental United States for use in future space programs.
Author

N74-30048# National Weather Service, Silver Spring, Md. Weather Analysis and Prediction Div.
NATIONAL WEATHER SERVICE APRIL 1972 TO MARCH 1973 PUBLIC FORECAST VERIFICATION SUMMARY
Alexander F. Sadowski and Geraldine F. Cobb Jun. 1974 40 p refs
(NOAA-TM-NWS-FCST-21) Avail: NTIS HC $5.00

Improvements in weather forecasts on a national level for the period April 1972 to March 1973 are shown for the Weather Service Office, the Weather Service Forecast Office area, and the National Weather Service region. Scores indicate substantial improvement in accurate precipitation forecasting over the previous year, although data show little change in forecasts of temperature.
Author

N74-30049# Technischen Universitaet, Hanover (West Germany).
HYGROMETRY FOR THE STUDY OF ELECTICAL MOISTURE MEASUREMENTS Ph.D. Thesis [HYGROMETRIE UND UNTERSUCHUNG UEBER DIE ELEKTRISCHE MESSUNG DER FEUCHTE]
Kurd G. Groeninger 1972 156 p refs In GERMAN
Avail: NTIS HC $11.00

Basic properties applications of electronic hydroelectric humidity sensors are outlined. The devices transform moisture information from a hygroscopic substance in the form of electrical resistance into an electrical system for optical evaluation by computer techniques. Electrical impedance varies with moisture absorption and content in the electrolytic semiconductor and affects its polarization capacity. Transl. by G.G.

N74-30050*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TORNADOLIKE GRAVITY-DRIVEN VORTEX MODEL
Robert G. Deissler and Donald R. Boldman Washington Aug. 1974 21 p refs
(NASA-TN-D-7738; E-7917) Avail: NTIS HC $3.00 CSCL 20D

The buoyancy-induced vorticity concentration produced as the fluid in a vortex accelerates vertically was studied. The boiloff from liquid nitrogen, to which a small amount of initial vorticity was added, provided a source of cool, heavy gas in which a concentration of vorticity took place. Condensation streamers made the flow visible. It is shown that the presence of a surface boundary layer is not necessary for the effective concentration of vorticity. A simple theoretical analysis of the phenomenon was also made. A radial contraction of the flow with vertical position and a characteristic hook shape in the top view of the streamlines were observed in both theory and experiment. The vorticity concentration observed may be similar to that which occurs in tornadoes. Author

N74-30051# Environmental Protection Agency, Research Triangle Park, N.C. National Air Data Branch.
NATIONAL EMISSIONS REPORT, 1972. NATIONAL EMISSIONS DATA SYSTEM (NEDS) OF THE AEROMETRIC AND EMISSIONS REPORTING SYSTEM (AEROS)
Jun. 1974 434 p
(EPA-450/2-74-012) Avail: NTIS HC $24.75

Annual cumulative estimates are presented of source emissions of five criteria pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. Source emissions data are reported to the U.S. Emvironmental Protection Agency. Summary data are presented for the nation as a whole, for individual states, and for Air Quality Control Regions and individual interstate portions thereof. The data compilations result from the operations of the National Emissions Data System, which functions as a component of the comprehensive EPA air information system-the Aerometric and Emissions Reporting System. Author

N74-30052# Danish Meteorological Inst., Copenhagen.
METEOROLOGICAL YEARBOOK. PART 1: DENMARK AND FAROE ISLANDS (EXCEPT GREENLAND), 1969
1974 193 p In ENGLISH and DANISH
(ISBN-87-7478-092-1) Avail: NTIS HC $12.75

Tabulated meteorological observations for 1969 are presented. The meteorological parameters reported include: atmospheric pressure, air temperature, monthly temperature means, maximum, and minimum temperatures, relative humidity, wind, cloudiness, and precipitation. F.O.S.

N74-30053*# Environmental Research and Technology, Inc., Lexington, Mass.
STUDIES IN THE USE OF CLOUD TYPE STATISTICS IN MISSION SIMULATION
David T. Chang, James H. Willand, David T. Chang, and James L. Cogan Jul. 1974 182 p refs
(Contract NAS8-28721)
(NASA-CR-129030) Avail: NTIS HC $5.50 CSCL 04B

A study to further improve NASA's global cloud statistics for mission simulation is reported. Regional homogeneity in cloud types was examined; most of the original region boundaries defined for cloud cover amount in previous studies were supported by the statistics on cloud types and the number of cloud layers. Conditionality in cloud statistics was also examined with special emphasis on temporal and spatial dependencies, and cloud type interdependence. Temporal conditionality was found up to 12 hours, and spatial conditionality up to 200 miles; the diurnal cycle in convective cloudiness was clearly evident. As expected, the joint occurrence of different cloud types reflected the dynamic processes which form the clouds. Other phases of the study improved the cloud type statistics for several region and proposed a mission simulation scheme combining the 4-dimensional atmospheric model, sponsored by MSFC, with the global cloud model. Author

N74-30054*# Scientific Translation Service, Santa Barbara, Calif.
SYNOPTIC AEROLOGICAL CONDITIONS FOR THE OCCURRENCE OF CLEAR AIR TURBULENCE
F. Weber Washington NASA Jul. 1974 29 p refs Transl. into ENGLISH from Meeting of the DGLR Sci. Comm. and Flight Performance and Flight Characteristics (Darmstadt), 12-13 Nov. 1970, DLR-Mitt-70-12 p 29-54
(Contract NASw-2483)
(NASA-TT-F-15794; DLR-Mitt-70-12) Avail: NTIS HC $4.50 CSCL 04B

The American definition of clear air turbulence (CAT) is first presented and the meteorological conditions for CAT are described. Measurements of CAT were made in 1963 over the North Atlantic route by a Lufthansa 707. CAT data for over 95 flights have been analyzed over the North Atlantic and Europe. It is concluded that CAT can be predicted using routine synoptic and aerological data. Author

N74-30055*# Northeastern Univ., Boston, Mass.
STUDY OF AIR POLLUTANT SIGNATURES FOR REMOTE SENSING Final Report
Welville B. Nowak 30 Jun. 1974 51 p refs
(Grant NGR-22-011-072)
(NASA-CR-138966) Avail: NTIS HC $5.75 CSCL 13B

Experimental results are presented for a possible new, indirect signature for air pollutants: the spectral reflectivity of plant leaves. Sub-visual changes (up to 160%) in the spectral reflectivity of bean and tobacco leaves were observed over the range 475nm to 750nm in response to SO2 exposures such as 2ppm/4hrs or 4ppm/16hrs, or to O3 exposures such as 90pphm/21hrs or 7.5pphm/292hrs. Such changes might be observed from a satellite using either laser or sunlight as the illumination source. Inasmuch as the plants appear to become acclimated to some of these exposure doses, environmental changes may be most important for this type of plant-response. Author

N74-30056# National Environmental Satellite Service, Washington, D.C.
ENVIRONMENTAL SATELLITE IMAGERY
Jun. 1974 95 p refs
Avail: NTIS HC $7.75

Hemispheric mosaics containing climatological and cloud pattern data are shown which were derived from Scanning Radiometer imagery obtained by the NOAA 3 satellite. Data obtained by the Very High Resolution Radiometer, which operates simultaneously with the Scanning Radiometer and views a portion of the same swath at higher resolution, are also given. Information on the date, time of day, orbit number, track, latitude range, and hemisphere viewed is included with each picture. Instrumentation, imaging techniques, and data processing are briefly discussed, and an availability reference is given for acquiring photographic copies of the mosaics shown. A.A.D.

N74-30057# Danish Atomic Energy Commission, Risoe. Research Establishment.
OCCURRENCES OF STABILITY CLASSES, WIND SPEEDS, AND WIND DIRECTIONS AS OBSERVED AT RISOE
N. O. Jensen Oct. 1973 40 p refs
(RISO-M-1666) Avail: AEC Depository Libraries HC $4.00

The meteorological data subject to analysis were measured during the years 1958 through 1967. The data are grouped in 12 wind direction sectors, 7 stability categories, and 5 wind-speed intervals. The number of observations in each group is given in tabular form. Some results are expressed by means of wind roses. Author (NSA)

N74-30058# Naval Postgraduate School, Monterey, Calif.
GEOSTROPHIC CIRCULATION OFF THE COAST OF CENTRAL CALIFORNIA M.S. Thesis
Robert Lee Brown Mar. 1974 254 p refs
(AD-777858) Avail: NTIS CSCL 08/3

The seasonal variations in temperature, salinity, water masses and geostrophic currents at the surface and 200 m are discussed for the region off the Central California coast near Monterey. The results were obtained from data collected on six cruises covering a span of two years from 1970 to 1972. It is shown that the surface currents are subject to marked seasonal variability with the mean flow characterized by eddies and filaments. The currents at 200 m are similar to those found at the surface. The bottom topography influences the direction of flow inside the 1000 fathom curve. Seasonal variations in temperature and salinity generally conformed to Skogsberg's (1936) annual cycle composed of three distinct hydrographic seasons. Only subtle changes in water masses from season to season were noted. (Modified author abstract) GRA

N74-30059# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODELING OF ATMOSPHERIC TURBULENT MOTION ABOVE A HETEROGENOUS UNDERLYING SURFACE
I. M. Zrazhevskii and V. V. Klingo 15 Apr. 1974 31 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Oberv. (Leningrad), no. 254, 1971 p 39-56
(AD-779171; FTD-MT-24-421-74) Avail: NTIS CSCL 04/2

The authors propose an approach to the search for similarity criteria for atmospheric turbulent flows, being bounded thus far to the neutral-stratified state of the atmosphere. The approach is based on the description of turbulent motion by means of the closed system of equations of B. I. Davidov, and some ideas of closing which were already used by A. S. Monin during the study of the boundary layer of the atmosphere. GRA

N74-30060# Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
EVALUATION OF POTENTIAL BENEFITS OF WEATHER MODIFICATION ON WATER SUPPLY Technical Report, 1971 - 1973
F. A. Huff 1 Apr. 1973 68 p refs
(Contract DI-14-06-D-7197)
(PB-228796/9; ISWS-73-CON-139; TR-1) Avail: NTIS HC $6.50 CSCL 04B

An investigation was made of the potential benefits of seeding-induced increases in runoff on alleviation of surface water shortages in Illinois. Runoff and weather data for 14 basins of various sizes and locations and with records of 30 years or longer were used to develop basin equations relating runoff to antecedent runoff indices, various precipitation parameters, and mean temperature. Hypothetical seeding-induced increases in precipitation were used with the appropriate basin equation to obtain an estimate of average runoff increases in the cold season (October-March), the warm season (April-September), and two sub-seasons, December-March and July-August. GRA

N74-30061# Georgia Inst. of Tech., Atlanta.
SENSITIVITY ANALYSIS OF A THUNDERSTORM RAINFALL MODEL
James R. Wallace and Kwei-Lin L. Wang Jan. 1974 85 p refs
(Contract DI-14-31-0001-3810)
(PB-230695/9; ERC-0374; OWRR-A-036-GA(2)) Avail: NTIS HC $4.00 CSCL 04B

In a sensitivity analysis of a previously developed digital model for the stochastic simulation of thunderstorm rainfall patterns of rainfall were generated for each of several combinations of some key parameters of the model. Statistics based on the depth, duration, and intensity of the rainfall were computed from a set of generated storms and compared with similar statistics computed from another set of storms generated after one of the model parameters had been changed by a predetermined amount. The parameters studied include: (1) the parameter which establishes the spatial distributions of rainfall intensity within the thunderstorm cell, (2) the cell duration, and (3) the maximum size attained by the cell. The model is capable of reproducing the rainfall characteristics as measured in the field; however, it is recommended that the same parameter values not be used, unless they can be varified with local data, to generate thunderstorm rainfall for localities where rainfall characteristics are likely to differ significantly from those in the Georgia Coastal Plains. (Modified author abstract) GRA

N74-30062# Olson Labs., Inc., Anaheim, Calif.
EFFECTIVENESS OF SHORT EMISSION INSPECTION TESTS IN REDUCING EMISSIONS THROUGH MAINTENANCE
R. D. Gafford and T. A. Huls Jul. 1973 495 p
(Contract EPA-68-01-0410)
(PB-231064/7; EPA-460/3-73-009) Avail: NTIS HC $18.25 CSCL 13B

The conduct, methodology, and results obtained from a two phase study to develop an inspection regime for detecting malfunctions responsible for mass exhaust emissions to the atmosphere are described. Loaded and unloaded methods of inspection were evaluated in the short cycle project. Emission reductions, costs, and cost effectiveness were determined for the Idle (unloaded) and dynamometer Loaded Steady State (LSS) inspection and maintenance regimes. Test procedures and vehicle emission summary tables are presented along with an analysis of how well various short emission inspection tests, including Idle and LSS, correlate with the 1972 and 1975 CVS Federal Test Procedures. GRA

N74-30063# Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
POTENTIAL OF PRECIPITATION MODIFICATION IN MODERATE TO SEVERE DROUGHTS Technical Report, 1971 - 1973
F. A. Huff 1 May 1973 32 p refs
(Contract DI-14-06-D-7197)
(PB-228817/3; ISWS-73-CON-140; TR-2) Avail: NTIS HC $4.75 CSCL 04B

An investigation was made of the potential of precipitation modification in moderate to severe droughts in Illinois to alleviate water shortages in such critical periods. The study involved time and space analyses of the natural precipitation distribution and consisted of two phases. The first involved analyses of monthly precipitation characteristics in major 12-month and 24-month droughts in the 50-year period, 1906-55. The second phase was concerned with a detailed study of storm characteristics in the 1953-54 drought, one of the worst on record in Illinois. Results indicated that conditions occasionally prevail in some moderate to severe droughts during which successful cloud seeding might provide temporary relieve over portions of an extensive drought region, especially with respect to providing agricultural relief. Potential for increasing municipal water supplies in the more severe drought conditions appear doubtful. (Modified author abstract) GRA

N74-30064# Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
LEGISLATIVE ACTIVITIES RELATING TO WEATHER MODIFICATION IN ILLINOIS Technical Report, 1971 - 1973
Stanley A. Changnon, Jr. 15 Sep. 1973 14 p refs
(Contract DI-14-06-D-7197)
(PB-228816/5; ISWS-73-CON-149; TR-3) Avail: NTIS HC $4.00 CSCL 04B

The purpose of this activity was to develop and secure a Illinois law that would permit and regulate weather modification activities within the state. Such legislation was deemed a prime requirement, not only for the proper execution of scientific experiments on weather modification in Illinois, but for the general benefit of citizens of Illinois through encouragement to properly conducted activities and protection from improperly conducted weather modification operations. It was intended to develop a model law that reflected the best aspects of weather modification legislation and experience in other states, and which would serve as a model for future legislation in other states. (Modified author abstract) GRA

N74-30065# National Environmental Research Center, Research Triangle Park, N.C. Meteorology Lab.
METEOROLOGICAL EPISODES OF SLOWEST DILUTION IN

CONTIGUOUS UNITED STATES Final Report
George C. Holzworth Feb. 1974 87 p refs
(PB-229588/9; EPA-650/4-74-002) Avail: NTIS HC $7.50 CSCL 04B

Five years of mixing height and wind speed data have been analyzed to determine the episodes of slowest dilution lasting 1, 2, 3, 4, and 5 days at each of 62 weather stations. Dates and meteorological data are given for each episode, the stations are ranked by their values on a slowest dilution parameter, the monthly variation of episodes is summarized, and maps are presented showing isopleths of slowest dilution values. This information should be of interest to those involved in modeling and appraising atmospheric transport and diffusion during episodes of extremely slow dilution. Author (GRA)

N74-30066# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN MISSILE NO. 343, ROUND NO. 640 AML (1 MARCH 1974) Meteorological Data Report
Mar. 1974 18 p refs
(DA Proj. 1T6-65702-D-127)
(AD-779374; DR-820) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 343, Round Number 640 AML, are presented in tabular form. GRA

N74-30067# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 16301 LITTLE JOHN MISSILE NO. 3190, ROUND NO. 708 RM
Apr. 1974 17 p
(DA Proj. 1T6-65702-D-127)
(AD-779383; DR-827) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 16301 Little John, Missile Number 3190, Round Number 708 RM, are presented in tabular form. Author (GRA)

N74-30068# Naval Research Lab., Washington, D.C.
MARINE FOG OBSERVATIONS IN THE ARCTIC Interim Report
S. G. Gathman and R. E. Larson 8 Apr. 1974 28 p refs
(AD-778999; NRL-7693) Avail: NTIS CSCL 04/2

Shipboard measurements of meteorology, droplet physics, radiochemistry, and atmospheric electricity are described for three marine fog events which occurred in the Greenland Sea during August and September 1972. These measurements include air temperature, sky and sea surface temperatures, humidity, windspeed, atmospheric potential gradient, atmospheric radon concentrations, droplet concentrations, and droplet size spectrums. A variable-path-length Lyman-alpha absorption humidiometer is described which is used for fine structure analysis of water vapor in fogs. In all three events persistent fogs were observed to exist in a subsaturated atmosphere with a relative humidity of less than 95% during sizeable portions of the events. (Modified author abstract) GRA

N74-30069# California Univ., Los Angeles. School of Engineering and Applied Science.
CATALYSTS FOR AUTOMOTIVE POLLUTION CONTROL DEVICES Final Report, May 1971 - Jun. 1973
Ken Nobe and George L. Bauerle Sep. 1973 164 p refs
Sponsored by the Air Resources Board of the State of Calif.
(PB-229351/2; UCLA-ENG-7371; ARB-R-PCA-189-73-02) Avail: NTIS HC $5.00 CSCL 13B

Various catalysts to control nitrogen oxide, carbon monoxide and hydrocarbon emissions from motor vehicle engines were investigated. Cathalysts were tested in the laboratory for reactions between NO and CO, NO and H2, CO and O2, and for NH3. Concentrations of the follwing substances were monitored: NO, CO, CO2, NO2, NH3, hydrocarbons, and in some cases N2O and O2. Catalysts tested included rare earth and transition metal oxides, noble metals, Monel, tungsten bronzes, nickel and stainless steel. The best catalysts were exposed to exhaust gases from a dynamometer mounted engine, in a small reactor under simulated oxidizing or reducing conditions. Finally, several catalysts were tested in a prototype two stage converter. Author (GRA)

N74-30070# Institute of Gas Technology, Chicago, Ill.
AERODYNAMIC CONTROL OF NITROGEN OXIDES AND OTHER POLLUTANTS FROM FOSSIL FUEL COMBUSTION. VOLUME 1: DATA ANALYSIS AND SUMMARY OF CONCLUSIONS Final Report
D. R. Shoffstall and D. H. Larson Oct. 1973 83 p
(Contract EPA-68-02-0216)
(PB-229102/9; EPA-650/2-73-033a) Avail: NTIS HC $4.00 CSCL 13B

A synopsis of data collected from investigating the relationship between combustion, aerodynamics, and pollutant emission characteristics of industrial burners is given. Five types of burners were studied: a scaled down utility power boiler burner, a high intensity (flat-flame) burner, a movable block burner, an axial flow burner, and a baffle burner used in steel reheat furnaces. Broad conclusions, applicable to all burners tested, were: burners using radial gas injection produce peak NO at 11% or less excess air; burners using axial gas injection produce peak NO at 22% or more excess air; NO concentration increases with increasing air preheat, but the magnitude of the change depends on burner design and the gas injection method; and changing from axial to radial gas injection consistently results in an increase in NO concentration. GRA

N74-30071# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
ATMOSPHERIC STRUCTURE WHITE SANDS MISSILE RANGE, NEW MEXICO. PART 2: TEMPERATURE, RELATIVE HUMIDITY, DEW POINT, STATION PRESSURE, DENSITY, CLOUDS, HYDROMETEORS, AND LITHOMETEORS
Marjorie McLardie Hoidale and Lamar Newman Apr. 1974 115 p Revised
(AD-779435; DR-822-Pt-2-Rev) Avail: NTIS CSCL 04/2

A statistical analysis of exoteric meteorological data is presented for (A) Station, White Sands Missile Range, New Mexico. The atmospheric parameters analyzed are surface temperature, relative humidity, dew point, pressure, density, precipitation, and observed weather and clouds. This climatological information is based on the period of observation from 1951-1973. Author (GRA)

N74-30072# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12811 LANCE MISSILE NO. 2155, ROUND NO. 221 SCT (26 APRIL 1974) Meteorological Data Report
Apr. 1974 41 p refs
(DA Proj. 1T6-65702-D-127)
(AD-779395; DR-834) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12811 Lance, Missile Number 2155, Round Number 221 SCT, are presented in tabular form. Author (GRA)

N74-30073# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13401 HONEST JOHN MISSILE NO. 340, ROUND NO. 642 RML (28 MARCH 1974) Meteorological Data Report
Mar. 1974 22 p
(DA Proj. 1T6-65702-D-127)
(AD-779380; DR-824) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13401 Honest John, Missile Number 340, Round Number 642 RML, are presented in tabular form. Author (GRA)

N74-30074# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 16201 LITTLE JOHN MISSILE NO. 3188, ROUND NO. 707 RM (29 MARCH 1974) Meteorological Data Report
Mar. 1974 17 p
(DA Proj. 1T6-65702-D-127)
(AD-779381; DR-825) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 16201 Little John, Missile Number 3188, Round Number 707 RM, are presented in tabular form. Author (GRA)

N74-30075# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.

THE 14801 LANCE MISSILE NOS. 2217/2218 ROUND NOS. 212 APT/213 APT (4 APRIL 1974) Meteorological Data Report
Apr. 1974 33 p
(DA Proj. 1T6-65702-D-127)
(AD-779382; DR-826) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14801 Lance, Missile Numbers 2217/2218, Round Numbers 212 APT/213 APT, are presented in tabular form. Author (GRA)

N74-30076# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
COMPREHENSIVE DATA HANDLING SYSTEM (CDHS), EMISSIONS INVENTORY SUBSYSTEM PROGRAM DOCUMENTATION
Jul. 1973 179 p
(Contract EPA-68-02-0638)
(PB-231839/2; APTD-1551) Avail: NTIS HC $12.00 CSCL 13B

The emissions inventory subsystem of the comprehensive data handling system provides a systematic method for collecting this data in a data base that will provide a central source for the information needed to help control air pollution. This document is intended to provide a more detailed knowledge of the programing logic of the emission inventory subsystem (EIS) of the comprehensive data handling system (CDHS). Section 2.0 contains an overview of the EIS system, a brief functional description of each component program comprising the system and a detailed discussion of the system master file and the general transaction cards required to build the master file. Section 3.0 through 6.0 contain descriptions of the program logic, organization, data formats and subroutines of each program in the EIS system. GRA

N74-30077# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INSTRUMENTS FOR INVESTIGATION OF FOGS AND CLOUDS AND MEASUREMENT OF HUMIDITY
V. A. Zaitsev and A. A. Ledokhovich 9 Apr. 1974 21 p Transl. into ENGLISH from the book "Pribory Dlya Issledovaniya Tumanov i Oblakov i Izmereniya Vlazhnosti" USSR, 1970 p 72-86
(FTD Proj. T74-02-20)
(AD-779207; FTD-MT-24-398-74) Avail: NTIS CSCL 04/2

The U.S.S.R. translation describes meteorological instruments for measurements of water content in water drop clouds. The instruments are carried by aircraft; descriptions and diagrams are included. GRA

N74-30078# Army Electronics Command, Fort Monmouth, N.J.
EXPERIMENTAL DETERMINATION OF TEMPERATURE PROFILES BY GROUND-BASED RADIOMETRY
E. R. Westwater, J. B. Snider, A. V. Carlson, and J. R. Yoder Apr. 1974 113 p refs
(AD-779531; ECOM-5537) Avail: NTIS CSCL 04/2

A one-week experiment was conducted to evaluate microwave and infrared radiometers for recovering low altitude temperature profiles. The radiometers were a two-channel microwave, operating at 53.5 and 54.5 GHz, and a four-channel infrared, operating near 15 micrometers. Meteorological support included radiosondes, helicopters, and an instrumented 500-foot tower. Statistical inversion of 13 radiometer angular scan data resulted in an average rms error of 2.0 K up to 10,000 feet for the microwave system. Significant features of thermal inversion structure were recovered. Difficulties in obtaining agreement between calculated and measured radiances precluded the retrieval of profiles from the infrared data. A continuous set of fixed-angle brightness observations correlated well with temperatures measured on the tower. The statistical inversion method and the Backus-Gilbert method were applied to the analysis of the accuracy and the spatial resolution of the ground-based system. Author (GRA)

N74-30079# Center for the Environment and Man, Inc., Hartford, Conn.
A MESOSCALE WINDFIELD ANALYSIS OF THE LOS ANGELES BASIN Environmental Monitoring Series
Gerald E. Anderson Jun. 1973 120 p refs
(Contract EPA-68-02-0223)
(PB-231832/7; CEM-4121-01-490C; EPA-650/4-73-001) Avail: NTIS HC $9.00 CSCL 04B

The rationale, derivation, and use of a mesoscale windfield analysis is presented. The analysis was applied to the Los Angeles Basin in support of a multi-phased effort of modelling ground level and/or three dimensional air pollution distributions in the region. Los Angeles air pollution modelling efforts supported by the Environmental Protection Agency are using data collected during an experimental program carried out during the fall of 1969. GRA

N74-30080# Miami Univ., Coral Gables, Fla.
SOUTH FLORIDA ECOLOGICAL STUDY. APPENDIX O. LOW-LEVEL TEMPERATURE INVERSIONS IN THE MIAMI, FLORIDA AREA Final Report
Harold P. Gerrish Jul. 1973 26 p refs
(PB-231630/5; DI-SFEP-74-17) Avail: NTIS HC $4.50 CSCL 04B

The 268-foot Pennsuco Radio Tower was instrumented at 5-foot, 105-foot and 205-foot levels to investigate low-level temperature inversions in the vicinity of Site 14, the recommended location for the Florida Regional Jetport. Data collected during the period February 22 to April, 1973 revealed that relatively strong ground-based inversions formed nightly for an average duration of 14 hours. The maximum strength was 23 F in the 200-foot layer. The inversions were stronger with east winds which suggests temperature enhancement aloft by the heat plume from urban Miami. It is concluded that urbanization creates poor dispersion conditions downwind from the heat island. Daytime inversions were observed for periods of one or two hours in association with troughs aloft, cold frontal passages, and sea-breeze fronts. GRA

N74-30081# National Environmental Research Center, Research Triangle Park, N.C. Chemistry and Physics Lab.
PROGRESS IN INSTRUMENTATION AND TECHNIQUES FOR MEASUREMENT OF AIR POLLUTANTS
A. H. Ellison Jan. 1974 23 p refs
(PB-231568/7) Avail: NTIS HC $4.25 CSCL 13B

This is a brief report on instrumentation and techniques for the measurement of air pollutants. It covers the techniques and instrumentation that have been promulated by EPA along with air pollution standards,which are in use by EPA for developing standards, and those that are being developed by EPA to meet current or future needs. Descriptions of these techniques are brief but reference to the detailed procedures are given. GRA

N74-30082# Environmental Prediction Research Facility (Navy), Monterey, Calif.
A FINE MESH SEA-LEVEL PRESSURE ANALYSIS SCHEME INCORPORATING EFFECTS OF ELEVATION AND TERRAIN
L. Brody Apr. 1974 35 p refs
(AD-779005; ENVPREDRSCHF-Tech-Note-16) Avail: NTIS CSCL 04/2

The document describes a fine mesh sea-level pressure analysis scheme for the Mediterranean area with a grid length of approximately 50 n mi. The analysis scheme is an adaptation of the Fields by Information Blending methodology, Sea-Level Pressure version (FIB/SLP) for the Northern Hemisphere. The effect of orography is included. To test the accuracy of the fine mesh FIB/SLP, a case study including high resolution satellite pictures from the Defense Meteorological Satellite Program (DMSP) system was compiled. This case study, which includes two of the most significant regional winds of the Mediterranean, showed that the analysis scheme is capable of distinguishing between similar pressure patterns which produce considerably different wind regimes. (Modified author abstract) GRA

N74-30083# Battelle-Northwest, Richland, Wash. Atmospheric Sciences Dept.
PRECIPITATION SCAVENGING OF ORGANIC CONTAMINANTS Final Report
Jeremy M. Hales and Richard N. Lee Apr. 1974 96 p refs
(Contract DAHC04-72-C-0035)
(AD-779551; AROD-10417-1-EN) Avail: NTIS CSCL 04/2

The EPAEC gas washout model has been applied to the organic tracers ethylacetoacetate and diethylamine. This model

uses source strength, vapor solubility and basic meteorological parameters to estimate the tracer concentration in downwind rain samples. A detailed error analysis has identified poorly defined tracer solubility as the major source of measured discrepancy with predictions. Field results have also been used to calculate the fractional washout of the vapor per kilometer from the source. The results together with existing diffusion models may be used to estimate the vapor concentrations of these materials along a plume trajectory. (Modified author abstract) GRA

N74-30084# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12812 LANCE MISSILE NO. 2158, ROUND NO. 216 RCT (12 APRIL 1974) Meteorological Data Report
Apr. 1974 40 p
(DA Proj. 1T6-65702-D-127)
(AD-779394; DR-829) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12813 Lance, Missile Number 2158, Round Number 216 RCT, are presented in tabular form. Author (GRA)

N74-30085# Army Communications Command, Fort Huachuca, Ariz. Advanced Concepts Office.
PRECIPITATION CLIMATOLOGY FOR MICROWAVE LINK PERFORMANCE IN SOUTHERN GERMANY
C. A. Samson Apr. 1974 35 p refs
(AD-779520; ACC-ACO-4-74) Avail: NTIS CSCL 04/2

Estimates of link and system reliability for microwave communications at 15 GHz depend principally on knowledge of rainfall intensity and storm size in the system area. The general characteristics of precipitation in southern Germany, particularly in those areas near Frankfurt, Stuttgart, Augsburg, and the upper Rhine valley, are discussed in the report. Data from rainfall-rate measurements at several locations are summarized, and the possibility of squall line formation is analyzed. Author (GRA)

N74-30086# Stanford Research Inst., Menlo Park, Calif.
OBJECTIVE METHODS FOR DETERMINING CLOUD MOTIONS FROM SATELLITE DATA
D. J. Hall, F. K. Tomlin, and D. E. Wolf Nov. 1973 49 p refs
(Contract N62306-71-C-0068)
(AD-779331; EPRF-TR-2-74(SRI)) Avail: NTIS CSCL 04/2

The PDP 11 computer, with a Vector General display interface, has been programmed to allow the generation of information representing artificial clouds using a cluster specification language. This language can also be used as input to a similar program that can be run on the CDC 6400 computer to generate identical data and later track the identical data. A cloud-motion vector field is then applied to the artificial clouds and they are assumed to move into a new position at a later time. Thus, we are able to produce artificial cloud pictures having some of the main features of real pictures. In general, the problem is to vary the known and controllable parameters of the artificial clouds and wind-vector fields so that various features of the cloud motion programs developed so far can be tested. In this way the limits of their performance, can be discovered which enables improvements to be made to the cloud-motion recognition programs. (Modified author abstract) GRA

N74-30087# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NUMERICAL EXPERIMENTS ON THE STUDY OF THE NONLINEAR INTERACTION OF LONG WAVES AND ZONAL CIRCULATION
I. G. Veil and S. A. Mashkovich 10 Apr. 1974 28 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauch.-Issled. Tsentr. SSSR (USSR), no. 71, 1970 p 3-23
(FTD Proj. T74-01-19)
(AD-779279; FTD-MT-24-490-74) Avail: NTIS CSCL 04/2

The long waves that are instrumental in the evolution of atmospheric macroprocesses were studied within the framework of a low-order nonlinear statement in which zonal flow varies with the inflow or outflow of energy from zonal circulation. A spectral model of the atmosphere which exhibited an extremely broad wave band was examined. Numerical experiments were performed on a barotropic model of the atmosphere in order to discover the conditions for the loss of stability of motion in which there is an exchange of kinetic energy between zonal and nonzonal motions, and also an interchangeable transition of kinetic energy to available potential energy. Formulas are presented which show that as a result of the nonlinear interaction of a single long wave with the zonal circulation, an auto-oscillating process appears whose period depends upon the dimensions of the wave and the initial profile of zonal velocity. The formula for a baroclinic atmosphere is also presented where solid rotation is considered and the nature of the process depends on the vertical wave structure. A.A.D.

N74-30088# Environmental Prediction Research Facility (Navy), Monterey, Calif.
A NUMERICAL SIMULATION OF WARM FOG DISSIPATION BY ELECTRICALLY ENHANCED COALESCENCE
Paul M. Tag Feb. 1974 53 p refs
(AD-777958; ENVPREDRSCHF-Tech-Paper-3) Avail: NTIS CSCL 04/2

Over the past decade, several techniques of dissipating warm fog, including heating, hygroscopic seeding, and helicopter downwash, have been proposed. Another method which involves the generation of an electric field through the fog has been suggested and tried in field experimentation. However, the mechanism responsible for visibility improvement, as a result of the electric field, is in question. (Modified author abstract) GRA

N74-30089# Office of Naval Research, London (England).
SURVEY OF METHODS OF OBSERVATION AND MEASUREMENT OF ATMOSPHERIC POLLUTION Conference Report
David M. Mason 31 Dec. 1973 36 p refs
(AD-779156; ONRL-C-27-73) Avail: NTIS CSCL 13/2

The report briefly summarizes highlights of a technical conference on the observation and measurement of atmospheric pollution held in Helsinki in the summer of 1973. An appendix includes a condensed program with topics, speakers, and affiliations. GRA

N74-30090# Informatics, Inc., Rockville, Md.
SOVIET CLIMATOLOGY
Stuart G. Hibben 4 Mar. 1974 57 p refs
(Contract F44620-72-C-0053)
(AD-779758; AFOSR-74-0785TR) Avail: NTIS CSCL 04/2

The report surveys Soviet developments in climatology and climate modification during the period from mid-1972 through November 1973. The selections were chosen primarily from regular Soviet scientific journals; several popular science sources were also surveyed. The abstracts are roughly classified into five general categories; (1) recent climate trends, (2) paleoclimatology, (3) meterology, (4) climatology of Eurasia and (5) climate modification. Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-30091*# Auburn Univ., Ala. Aerospace Engineering Dept.
STUDY OF EFFECTS OF UNCERTAINTIES ON COMET AND ASTEROID ENCOUNTER AND CONTACT GUIDANCE REQUIREMENTS. PART 1: GUIDANCE AND NAVIGATION STUDIES Final Report
15 Dec. 1973 27 p refs
(Contract NAS8-27664)
(NASA-CR-120329) Avail: NTIS HC $4.50 CSCL 17G

A guidance algorithm that provides precise rendezvous in the deterministic case while requiring only relative state information is developed. A navigation scheme employing only onboard relative measurements is built around a Kalman filter set in measurement coordinates. The overall guidance and navigation procedure is evaluated in the face of measurement errors by a detailed numerical simulation. Results indicate that onboard guidance and navigation for the terminal phase of rendezvous is possible with reasonable limits on measurement errors. Author

N74-30092*# Auburn Univ., Ala. Aerospace Engineering Dept.
STUDY OF EFFECTS OF UNCERTAINTIES OF COMET AND ASTEROID ENCOUNTER AND CONTACT GUIDANCE REQUIREMENTS. PART 2: TUMBLING PROBLEM STUDIES Final Report
John E. Cochran, Jr. 3 May 1974 33 p refs
(Contract NAS8-27664)
(NASA-CR-120330) Avail: NTIS HC $4.75 CSCL 17G

The problem of determining the rotational motion of a tumbling celestial body of the asteroid type using spacecraft-acquired data is addressed. The rotational motion of the body is modeled by free-Eulerian motion of a triaxial, rigid body and its translational motion with respect, to a nonrotating, observing spacecraft, which is not thrusting, is assumed to be uniform during the time observations are made. The mathematical details which form the basis for a digital simulation of the motion and observations are presented. Two algorithms for determining the motion from observations for the special case of uniform rotational motion are given. Author

N74-30093*# Aerospace Systems, Inc., Burlington, Mass.
NAVIGATION AND GUIDANCE REQUIREMENTS FOR COMMERCIAL VTOL OPERATIONS Interim Technical Report
William C. Hoffman, Walter M. Hollister, and Jack D. Howell Jan. 1974 252 p refs
(Contract NAS1-12199)
(NASA-CR-132423; ASI-TR-74-17) Avail: NTIS HC $15.75 CSCL 17G

The NASA Langley Research Center (LaRC) has undertaken a research program to develop the navigation, guidance, control, and flight management technology base needed by Government and industry in establishing systems design concepts and operating procedures for VTOL short-haul transportation systems in the 1980s time period. The VALT (VTOL Automatic Landing Technology) Program encompasses the investigation of operating systems and piloting techniques associated with VTOL operations under all-weather conditions from downtown vertiports; the definition of terminal air traffic and airspace requirements; and the development of avionics including navigation, guidance, controls, and displays for automated takeoff, cruise, and landing operations. The program includes requirements analyses, design studies, systems development, ground simulation, and flight validation efforts. Author

N74-30094*# TRW Systems Group, Redondo Beach, Calif.
AIR TRAFFIC CONTROL SURVEILLANCE ACCURACY AND UPDATE RATE STUDY Final Report
J. H. Craigie, D. D. Morrison, and I. Zipper Mar. 1973 198 p refs
(Contract NAS5-21603)
(NASA-CR-139043; TRW-18618-6004-RU-00) Avail: NTIS HC $13.00 CSCL 17/7

The results of an air traffic control surveillance accuracy and update rate study are presented. The objective of the study was to establish quantitative relationships between the surveillance accuracies, update rates, and the communication load associated with the tactical control of aircraft for conflict resolution. The relationships are established for typical types of aircraft, phases of flight, and types of airspace. Specific cases are analyzed to determine the surveillance accuracies and update rates required to prevent two aircraft from approaching each other too closely. Author

N74-30095*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STOL TERMINAL AREA NAVIGATION SYSTEM
Frank Neuman and David N. Warner, Jr. May 1974 69 p refs
(NASA-TM-X-62348) Avail: NTIS HC $6.50 CSCL 17G

The mechanization and performance of a STOL terminal area navigation system are described. The purpose of the navigation system is to allow flying with precision 4D-guidance along complex flight paths in the terminal area, and to develop requirements for STOL operations in the 1980s. The navigation aids include an experimental microwave landing system, MODILS. The systems description begins with the navigation aids. It is shown how the data are transformed and combined with other data to obtain position and velocity estimates. Also presented are some of the design changes and other features that were introduced as a result of flight testing. The various ways of displaying navigation-derived data are given. Finally, simulator and flight test results are discussed. Author

N74-30096*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LANDING APPROACH EVALUATION OF AN INTEGRATED CRT DISPLAY FOR GENERAL AVIATION AIRCRAFT
Peter D. Talbot and Glen W. Stinnett, Jr. Washington Jul. 1974 15 p Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-3096; A-5208) Avail: NTIS HC $3.00 CSCL 17G

A flight director adaptable to general aviation aircraft was evaluated for the landing approach task in a twin turbojet business aircraft. The flight director combined aircraft heading, pitch and roll atitude, and ILS (Instrument Landing System) signals into a single picture on a small cathode ray tube (CRT) to give the pilot an integrated picture of the aircraft situation. The display is unique in that it presents the information on a CRT and gives quasi-command signals to the pilot. The particular display investigated was a preproduction version of the Kaiser Model FP-50 flight director. Approaches made with visual references only, with a conventional ILS displacement instrument, and with the CRT display were compared in terms of tracking performance and pilot workload. Tracking performance of three research pilots using the CRT display was superior to that using the conventional ILS instrument and comparable to that under VFR conditions. Pilot workload (based on pilot comments) was not clearly decreased. Author

N74-30097# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIR NAVIGATION: SELECTED CHAPTERS
V. I. Osadshii 2 Apr. 1974 206 p refs Transl. into ENGLISH from the monograph "Vozdushnaya Navigatsiya" 1972 p 143-190
(AD-778563; FTD-MT-24-280-74) Avail: NTIS CSCL 17/7

Radio navigation systems are presented which consist of goniometric and ranging channels that provide the simultaneous determining of aircraft bearing and distance relative to a ground station. The area of guaranteed radio traffic of an aircraft with a ground station is calculated according to the procedure for determining the range of operation of VHF radio aids. M.C.F.

N74-30098# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
KALMAN FILTER DESIGN FOR AN INERTIAL NAVIGATION SYSTEM AIDED BY NON-SYNCHRONOUS NAVIGATION SATELLITE CONSTELLATIONS M.S. Thesis
Ronald Ray Butler and George Truitt Rhue Mar. 1974 174 p refs
(AD-779724; GA/EE/74M-1) Avail: NTIS CSCL 17/7

The report is a Kalman filter design study for the proposed Integrated Navigation Satellite/Inertial System (INI). Primary emphasis is placed upon determination of the best filter state variable vector and investigation of various measurement rates using external range measurements from a set of 27 non-synchronous satellites. The INI system errors are assumed to be represented by a 44 state linear system model, and the filter operates without benefit of an altimeter. A one-hour INI flight at constant speed and altitude over a great circle path is simulated on the digital computer and filter designs are compared by plotting the system position, velocity, and attitude error covariances versus time. A 15 state filter with weak coupling terms removed is determined to provide the best tradeoff between accuracy and computational burden. Filter performance is compared at 5, 15, 30, 60 and 90 second measurement update rates. Additionally, optimal sequencing of satellite observables is shown to provide improved performance. Author (GRA)

N74-30099# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ACCURACY LIMITATIONS OF RANGE-RANGE (SPHERICAL) MULTILATERATION SYSTEMS
Harry B. Lee 11 Oct. 1973 112 p refs

(Contract DOT-TSC-RA-3-8)
(PB-228135/0; TN-1973-43; DOT-TSC-RA-3-8-(1)) Avail: NTIS HC $4.50 CSCL 17G

This report presents a novel procedure for determining the accuracy of range-range (or spherical) multilateration systems. The procedure is a generalization of one previously described for hyperbolic multilateration systems. A central result is a demonstration that the inverse of the covariance matrix for positional errors corresponds to the moment of inertia matrix of a simple mass configuration. The insight afforded by this fact is used to resolve a number of questions relating to accuracy.
GRA

N74-30100# IIT Research Inst., Annapolis, Md.
AN AUTOMATED FAA FREQUENCY ASSIGNMENT SYSTEM
L. Beall, R. Crisafulli, J. Morrow, and S. Vangaasbeck Dec. 1973 96 p
(Contract F19628-73-C-0031; DOT-FA70WAI-175; AF Proj. 649E)
(AD-779086; ECAC-PR-73-049; FAA-RD-73-184) Avail: NTIS CSCL 17/7

An automated frequency assignment system is developed as a means of providing frequency assignment plans for FAA Air Traffic Control (ATC) VHF communications facilities in the continental United States. The system is implemented by means of a series of computer programs (described herein) designated collectively as the Frequency Assignment System (FAS). FAA-supplied ATC data is used to build an intersite channel-separation matrix which serves as input to the assignment process. Assignment techniques are developed that make maximum use of the available spectrum. Discriptions are included on how the frequency manager can vary the program inputs to investigate the advantages of different assignment procedures.
Author (GRA)

N74-30101# Mitre Corp., McLean, Va.
STUDY OF THE VORTAC SYSTEM AND ITS GROWTH POTENTIAL Final Report
S. Ahmed Meer Nov. 1973 178 p refs
(Contract DOT-FA70WAI-2448)
(AD-779536; MTR-6547; FAA-EM-74-9) Avail: NTIS CSCL 17/7

The report describes the basic features of the VORTAC System. The inherent signal and equipment constraints to future development of the system are identified. The report shows that the VORTAC System can evolve to a high-accuracy-high-capacity navigation system for the AATMS time frame of 1995 and beyond. Included in the report are System costs, VORTAC deployment, RNAV considerations and integration of the VORTAC system with synchro-DABS/DME. Recommendations are made for new modular VOR receiver design and a program for cost-effective station operation. Author (GRA)

N74-30102# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROVISIONAL DATA LINK INTERFACE STANDARD FOR THE DABS TRANSPONDER Project Report
G. V. Colby, P. H. Robeck, and J. D. Welch 25 Apr. 1974 23 p refs
(Contract DOT-FA72WAI-261; FAA Proj. 034-241-012)
(AD-778144; ATC-34; FAA-RD-74-64) Avail: NTIS CSCL 17/7

The document specifies provisional data link interface standards for the DABS transponder. It describes the function, timing, and electrical properties of the signals flowing to and from both the Standard Message Interface and the Extended Length Message Interface. Author (GRA)

N74-30103# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROVISIONAL MESSAGE FORMATS FOR THE DABS/NAS INTERFACE
D. Reiner and H. F. Vandevenne 25 Apr. 1974 41 p refs
(Contract DOT-FA72WAI-261)
(AD-778450; ATC-33; FAA-RD-74-63) Avail: NTIS CSCL 17/7

The document defines formats for messages which are to be transmitted between Discrete address Beacon System (DABS) and National Airspace System (NAS) facilities (en route or terminal). These messages include one-way Surveillance Reports to NAS and two-way Communications Messages. The latter support data link functions between NAS and DABS-equipped aircraft, as well as aiding in the monitoring and control of DABS sensors. These message formats will be used in the design and construction of interface equipment and ground data links for prototype system test and evaluation at NAFEC during Phase II of the DABS Development Program; and, with modifications resulting from this test and evaluation effort, will form the basis for the operational implementation of DABS. Author (GRA)

N74-30104# National Aviation Facilities Experimental Center, Atlantic City, N.J.
NATIONAL AIRSPACE SYSTEM ENROUTE STAGE A SYSTEM ENGINEERING AND ANALYSIS, INVESTIGATION OF SYSTEM PROBLEMS, CAPACITY TESTING Final Report, Aug. 1972 - Oct. 1973
Harry T. Morgan, Jr. Apr. 1974 27 p refs
(AD-778479; FAA-NA-73-109; FAA-RD-74-51) Avail: NTIS CSCL 17/7

A series of special engineering tests was designed to determine what, if any, capacity limitations would occur when NAS 3d1 was operated under steadily increasing traffic load. The tests were performed at the National Aviation Facility Experimental Center (NAFEC) employing the Digital Simulation Facility and the System Support Facility. Both the Display Channel Complex and the Computer Display Channel modes of operation were investigated. NAS 3d1 successfully met capacity test criteria. This report describes these tests and the results obtained.
Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-30105# Oak Ridge National Lab., Tenn. Neutron Physics Div.
EXPERIMENTALLY DETERMINED NEUTRON AND GAMMA-RAY SPECTRA FROM AN ENCAPSULATED Cm2O3 POWER SOURCE
R. M. Freestone, Jr. Mar. 1974 29 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4459) Avail: NTIS HC $3.50

The experimentally determined neutron and gamma ray spectra of Cm2O3 spontaneously fissioning source are presented. The neutron spectrum is given for the energy range 30 keV to 10 MeV, while the gamma ray spectrum spans the energy range 205 keV to 12 MeV. Author (NSA)

N74-30106# Massachusetts Inst. of Tech., Cambridge. Space Propulsion Lab.
HEAT TRANSFER AND CONTAINMENT PROCESS IN TWO PHASE CAVITY NUCLEAR REACTOR Final Report, 22 Nov. 1971 - 21 Jan. 1973
D. B. Stickler, H. Lakshmikantha, and W. S. Lewellen Feb. 1974 158 p refs
(Contract F33615-72-C-1344; AF Proj. 7116)
(AD-778427; ARL-TR-74-0007) Avail: NTIS CSCL 21/6

Experimental study of liquid containment and heat transfer rates in a gas driven confined vortex is performed with reference to desired operating conditions for a liquid core nuclear rocket. Simple methods of containment and transport processes are used to scale the data to a predicted performance capability of a nominal 20,000 pound thrust, 1200 second specific impulse system. Molten fuel containment, as a two phase zone on the cylindrical cavity side walls, appears feasible at or above levels required for thermal neutron reactor criticality. Two potential problems are that the input gas flow distribution must be chosen to avoid freezing of the nuclear fuel at the cavity walls, and that the overshoot of the fuel temperature relative to the peak gas stagnation temperature may cause excessive fuel vapor loss. (Modified author abstract) GRA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-30107 California Inst. of Tech., Pasadena.
THEORY, FABRICATION AND PERFORMANCE OF SOME INTEGRATED OPTICAL DEVICES Ph.D. Thesis
Sasson Roger Somekh 1974 178 p
Avail: Univ. Microfilms Order No. 74-14288

Recent progress in the fabrication of low attenuation optical fibers raises the attractive possibility of optical communications via these waveguides. Integration of different optical functions on one substrate in the form of optical circuits forms ideal terminals for such a communication network. The theory, fabrication and performance of a few building stones of such optical circuits are discussed. Optical directional couplers capable of coupling light from one channel to another are described and their use as switches is discussed. Distributed feedback for integrated lasers is analyzed. Laser action in a GaAs waveguide, in which distributed feedback was supplied by corrugations fabricated on the surface, is described. Longitudinal and transverse mode control of such a laser is also discussed. An analysis of nonlinear interactions in thin films is used to point out new methods for phase matching and ways to implement them. Dissert. Abstr.

N74-30108 Pennsylvania State Univ., University Park.
THE EFFECTIVENESS OF A BAFFLE IN REDUCING THE NOISE OF AN ACOUSTIC RECEIVING ARRAY Ph.D. Thesis
Gerald Lloyd Mohnkern 1973 148 p
Avail: Univ. Microfilms Order No. 74-16046

A study was made of an acoustic receiving array shielded by a rigid, semi-infinite baffle from a surface of noise sources. The baffle and the surface of noise are both horizontal, and are separated by a large number of wavelengths, while the sensors of the array are within a few wavelengths of the edge of the baffle. It is assumed that the noise sources radiate as dipoles, and are distributed uniformly on the surface. Array output noise was computed by calculating the cross-spectral density for sensor pairs in the array, and then using frequency-domain beamforming. Array output noise was also calculated for free field arrays, which have no baffle. It was found that the increment in the array output noise, when a sensor is added to a long vertical line array with half wavelength spacing between sensors, approaches zero. In contrast, the increment in the array output noise when a sensor is added to a similar horizontal array approaches a value somewhat greater than the output noise of a single sensor. Dissert. Abstr.

N74-30109*# Radiation, Inc., Ann Arbor, Mich.
HOLOGRAPHIC OPTICAL ELEMENTS: FABRICATION AND TESTING Final Report, Jul. 1973 - Mar. 1974
R. G. Zech, M. Shareck, and L. M. Ralston Mar. 1974 94 p refs
(Contract NAS8-28949)
(NASA-CR-120272; Rept-1321-F-2) Avail: NTIS HC $7.75 CSCL 20F

The basic properties and use of holographic optical elements were investigated to design and construct wide-angle, Fourier-transform holographic optical systems for use in a Bragg-effect optical memory. The performance characteristics are described along with the construction of the holographic system. Author

N74-30110# Technischen Universitaet, Hanover (West Germany).
LIGHT SCATTERING ON He-3/He-4 MIXTURES IN THE HYDRODYNAMIC AND CRITICAL REGIONS Ph.D Thesis [LICHTSTREUUNG AN He-3/He-4 MISCHUNGEN IM HYDRODYNAMISCHEN UND KRITISCHEN BEREICH]
Klaus-Dietrich Kniffki 1972 99 p refs In GERMAN
Avail: NTIS HC $8.00

A two fluid model is used to calculate the response functions for light scattering in superfludic He-3/He-4 mixtures. Effects of dissipation processes and ordering parameter relaxations are considered. A generalized dynamic scale hypothesis is used to calculate the spectrum for the critical region. Transl. by G.G.

N74-30111# Technische Hogeschool, Delft (Netherlands).
INVESTIGATION OF MAGNETIC INTERACTIONS OF NICKEL (II), COLBALT (II), AND MANGANESE (II), IN MAGNETICALLY DILUTE SYSTEMS Ph.D. Thesis
Gerardus Cornelis Maria VanLeeuwen 29 May 1974 89 p refs
Avail: NTIS HC $7.50

Experimental data are presented from magnetic superexchange studies of three related transition metal ions in the simple fcc lattices of MgO and MgS. Results are compared with the predictions of a qualitative scheme based on the combined theories of Anderson-Owen and Van Vleck-Tanabe. Author

N74-30112# Technische Hochschule, Hanover (West Germany).
CRITICAL LIGHT SCATTERING AND SOUND ABSORPTION IN THE LAMBDA TRANSFER OF He-4 Ph.D. Thesis [ZUR KRITISCHEN LICHTSTREUUNG UND SCHALLABSORPTION AM LAMBDA UEBERGANG VON He-4]
Han-Hermann Kretzen 1972 83 p refs In GERMAN
Avail: NTIS HC $7.25

A mode-mode coupling model is formulated and used to calculate the contributions of ordering parameters and entrophy to the light scattering density-density correlation function of He-4 near T sub lambda. A transfer formula is also developed for the critical acoustic damping near He-4. Transl. by G.G.

N74-30113# Technischen Universitaet, Hanover (West Germany).
ON THE ARC MOTION IN THE MAGNETIC FIELD OF CONTACT ARRAYS DURING INITIATION Ph.D. Thesis [UEBER DIE LICHTBOGENBEWEGUNG IM MAGNETFELD VON KONTAKTANORDNUNGEN WAEHREND DES OEFFNUNGSVORGANGES]
Uwe Druecker 1973 178 p refs In GERMAN
Avail: NTIS HC $12.00

The arc movement at direct current up to 300A is studied by observing arc time interval in relation to the current, cut-off moment, magnetic induction, and contact initiation velocity. Evaluation of photoelectric measurements shows that movement initiation after arc fomation is mainly determined by the arc current momentum, induction value dimensions in the arc axis and the contact interval. Transl. by G.G.

N74-30114*# Oregon Univ., Eugene. Inst. of Theoretical Science.
FEASIBILITY OF COHERENT X-RAY PRODUCTION BY X-RAY PUMPING
Paul L. Csonka and Bernd Crasemann 1974 10 p refs Sponsored jointly by NASA, AEC, and Army Res. Office
(NASA-CR-138943; NT-054/74) Avail: NTIS HC $4.00 CSCL 20H

It is suggested that coherent X-rays can be produced by inverting the electron population in a suitable target, such as Li, through irradiation with X-rays generated by fast electrons traversing an electromagnetic field (as in a storage ring). Conditions to be satisfied by target and radiation parameters are stated, and examples given. Author

N74-30115# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
ANOMALOUS RESISTIVITY IN A MAGNETIC NEUTRAL POINT
Nobuyoshi Ohyabu and Nobuki Kawashima May 1974 10 p refs
(ISAS-512-Vol-39-No-9) Avail: NTIS HC $4.00

Anomalous resistivity was observed in a collision-free magnetic neutral point discharge. It appeared as a sharp rise (hump) of voltage between discharge electrodes. The hump appeared earlier, and its height increased as: (1) the plasma density decreased; (2) the discharge voltage was increased; and (3) the external quadrupole magnetic field was increased. The electron temperature was measured with the X-ray absorption method. The electron rose to 10 KeV at the time of the appearance of the hump, indicating that the magnetic energy which is supplied from the electric energy is dissipated and converted into the thermal energy of the plasma. Author

N74-30116# Electrotechnical Lab., Tokyo (Japan).
STANDARDS OF SPECTRAL RADIANCE AND IRRADIANCE

FOR THE WAVELENGTH REGION OF 0.25 TO 2.5 MICROMETERS
Mamoru Suzuki, Motoi Nanjo, Mitsuhiro Habu, Takehiko Nagasaka, Isamu Ueda, and Hideyuki Minato Dec. 1973 87 p refs In JAPANESE; ENGLISH summary
Avail: NTIS HC $7.50

Methods are described for the establishment of spectral radiance and irradiance standards in the wavelength region of 0.25 to 2.5 micrometers. E.J.O.

N74-30117# Laboratoire de Physique Theorique et des Hautes Energies, Paris (France).
ASYMPTOTIC BEHAVIOUR FROM THE EXACT CALLAN-SYMANZIK EQUATIONS
Ph. Meyer and N. Sourlas Jun. 1974 35 p refs
(LPTHE-74/15; PTENS-74/1) Avail: NTIS HC $4.75

The exact Callan-Symanzik equations written in the functional formalism are solved without dropping the mass-insertion terms. From the exact solution, the asymptotic behaviour of Green's function is found at nonexceptional momenta without referring to Weinberg's power-counting theorem. In the case of asymptotically-free theories, the nonleading asymptotic terms are computed without using Wilson's operator product expansion. Finally, the case of exceptional momenta, and the asymptotics of theories with broken symmetry are discussed. Author

N74-30118*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
REAL TIME LIQUID CRYSTAL IMAGE CONVERTER Patent Application
James B. Robertson, inventor (to NASA) Issued 24 Jul. 1974 8 p
(NASA-Case-LAR-11206-1; US-Patent-Appl-SN-491413) Avail: NTIS HC $4.00 CSCL 20F

A liquid crystal image converter that allows viewing while the image is being recorded in real time is presented. The converter is comprised of an opaque layer inserted between the liquid crystal layer and the photoconductor layer for shielding the photoconductor layer from the light for viewing the image formed in the liquid crystal layer, and for allowing an electric current to flow through the opaque layer whereby the image in the crystal can be viewed while it is being formed without interfering with the image forming process. This device is used to convert a nonvisible image, in the infrared or ultraviolet, into a visible image. NASA

N74-30119*# Keuffel and Esser Co., Morristown, N.J.
ZONE GENERATOR FOR LARGE SPACE TELESCOPE TECHNOLOGY Final Report
Kent E. Erickson 19 Jun. 1974 46 p
(Contract NAS1-11483)
(NASA-CR-132471) Avail: NTIS HC $5.50 CSCL 20F

A concept is presented for monitoring the optical adjustment and performance of a Large Space Telescope which consists of a 1.2m diameter turntable with a laser stylus to operate at speeds up to 30 rpm. The focus of the laser stylus is under closed loop control. A technique for scribing zones of suitable depth, width, and uniformity applicable to large telescope mirrors is also reported. M.C.F.

N74-30120*# North Carolina State Univ., Raleigh. Center for Acoustical Studies.
A THEORETICAL AND EXPERIMENTAL STUDY OF WOOD PLANER NOISE AND ITS CONTROL
John S. Stewart Aug. 1972 195 p refs
(Grant NGR-34-002-035)
(NASA-CR-112314) Avail: NTIS HC $12.75 CSCL 20A

A combined analytical and experimental study of wood planer noise is made and the results applied to the development of practical noise control techniques. The dominant mechanisms of sound generation are identified and an analysis is presented which accurately predicts the governing levels of noise emission. Planing operations in which the length of the board is much greater than the width are considered. The dominant source of planer noise is identified as the board being surfaced, which is set into vibration by the impact of cutterhead knives. This is determined from studies made both in the laboratory and in the field concerning the effect of board width on the resulting noise, which indicate a six decibel increase in noise level for each doubling of board width. The theoretical development of a model for board vibration defines the vibrational field set up in the board and serves as a guide for cutterhead redesign. Author

N74-30121*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPECTRAL REFLECTANCE PROPERTIES OF BLACK CHROME FOR USE AS A SOLAR SELECTIVE COATING
Glen E. McDonald 1974 12 p refs Presented at the US Sect. Ann. Meeting of the Intern. Solar Energy Soc., Fort Collins, Colo., 19-23 Aug. 1974
(NASA-TM-X-71596; E-7915) Avail: NTIS HC $3.00 CSCL 20F

The NASA-Lewis Research Center has determined that a widely available commercially electroplated decorative finish known as black chrome has desirable solar selective properties. The spectral reflectance properties of a commercially prepared black chrome on steel were measured. Values are presented for reflectance of the black chrome, and compared with the reflectance of black paint (Nextel) and with two available samples of black nickel which had been prepared for solar selective properties. The reflectance of black chrome, of the two black nickels, and of black paint integrated over the solar spectrum for air mass 2 were 0.132, 0.123, 0.133, and 0.033, respectively. The reflectance of the black chrome, two black nickels, and of the black paint integrated over the blackbody spectrum for 250 F from 3 to 15 microns are 0.912, 0.934, 0.891, and 0.033, respectively. These reflectance measurements indicate absorptivity-to-emissivity values of 9.8, 13.8, 8.0, and 1.00, respectively. Author

N74-30122# Joint Publications Research Service, Arlington, Va.
AUTOMATIC TWO COORDINATE SYSTEM FOR CHECKING THE POSITION OF A TARGET BY A LIGHT BEAM
V. V. Lavrentyev and V. L. Musyakov 1 Jul. 1974 8 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr (Leningrad), no. 3, 1974
(JRPS-62359) Avail: NTIS HC $4.00

The report contains an investigation of the features of formation of reference signals in a two-coordinate system for checking the position of a target according to an amplitude-phase modulated laser beam. Author

N74-30123# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
THE 0.6 TESLA OMNI-DIRECTIONAL SUPERCONDUCTING MAGNET SYSTEM
D. K. Wagner Sep. 1973 28 p refs
(Contract AT(11-1)-3150)
(COO-3150-16) Avail: NTIS HC $3.50

The design and construction of a superconducting magnet system, producing a maximum magnetic field of 0.6 T with any desired direction, is described. The magnet consists of a pair of Helmholtz coils, which can be rotated about a fixed solenoid. The azimuthal angle of the field is selected manually by rotation of the Helmholtz coils, and the polar angle is selected electronically by adjusting the currents in the Helmholtz coils and solenoid appropriately. The latter is accomplished automatically by means of the associated power supply, which is described in detail. The accuracy of the magnet system is approximately 0.8 mT or 1/2% of the field magnitude, whichever is greater. This system has proved to be indispensable for studies of the radio-frequency size effect in pure metals at low temperatures. Author (NSA)

N74-30124# Maryland Univ., College Park. Computer Science Center.
SOME BASIC IMAGE DEGRADATION AND ENHANCEMENT TECHNIQUES Interim Report
J. S. Weszka, E. J. Carton, J. A. Verson, J. M. Mohr, and A. Rosenfeld Dec. 1973 22 p refs
(Contract F44620-72-C-0062; AF Proj. 9769)
(AD-778418; TR-278; AFOSR-74-0626TR) Avail: NTIS CSCL 09/2

The report documents a collection of basic techniques for degrading or enhancing images. Included are blurring by averaging or iterated averaging; deblurring by contrast stretching, histo-

gram flattening, and combination of the Laplacian with the original image; addition of noise; removal of periodic noise by selective spatial frequency filtering, and of salt and pepper noise by selective local averaging; and object extraction by semi-thresholding. Examples of the results obtained using these programs are given. Author (GRA)

N74-30125# Massachusetts Inst. of Tech., Cambridge. Spectroscopy Lab.
REASEARCH DIRECTED TOWARD THE DEVELOPMENT OF AN IMPROVED PROCESS FOR OPTICAL GRATING RULING Final Report, 1 Feb. - 30 Jun. 1973
George R. Harrison 1 Dec. 1973 27 p refs
(Contract F19628-73-C-0189; AF Proj. 7649)
(AD-777851; AFCRL-TR-73-0760; Rept-3) Avail: NTIS CSCL 20/6

The largest interferometrically controlled ruling engine yet constructed, of 18 x 24 inch capacity, has continued in successful use, and has ruled more than 70 large diffraction gratings and echelles, in sizes up to 16 x 24 inches. Replicas of echelles and gratings ruled, and some originals, are now in use at various observatories and in several university laboratories. The machine has proved itself as reliable as much smaller engines, and the principal difficulties in ruling gratings in these previously unattainable sizes are found now to relate to the obtaining of satsifactory blanks, suitable coatings, and to wear of the ruling diamond when total groove length exceeds about 80,000 meters per grating. Echelles having blaze angles up to 84 degrees have been produced and tested, and the various echelle parameters are discussed. Author (GRA)

N74-30126# Naval Ordnance Lab., White Oak, Md.
AMPLITUDE FLUCTUATIONS OF THE SOUND FROM A LOW-FREQUENCY MOVING SOURCE IN THE DEEP SEA Final Report
R. J. Urick 26 Feb. 1974 30 p refs
(AD-778299; NOLTR-74-43) Avail: NTIS CSCL 17/1

The sound from a steady source in the sea fluctuates in amplitude on reaching a distant receiver. One way to express the fluctuation is by means of its power spectrum, normalized to the mean level of the carrier frequency. Such spectra have been obtained for three minute samples of the signals from 142 and 275 Hz CW sources towed together in range as far as the first convergence zone from sonobuoy hydrophones at 90,300 feet. At all ranges and at both depths, the spectra in the band 0.01 to 0.5 Hz (periods two to 100 seconds) show a broad peak near 0.1 Hz. The integral under the spectrum, equalling the square of the modulation coefficient, ranges from less than one to about 50 percent, with a strong dependence on carrier level. That is, the fluctuation is low when the mean level in high, and vice versa, so that the fluctuation power tends to be constant. These fast fluctuations are doubtless caused by ocean waves. At the other end of the frequency range of interest, slow fluctuations are found having periods from 10 seconds to one hour that are probably caused by the range movement of the source. (Modified author abstract) GRA

N74-30127# Naval Research Lab., Washington, D.C. Solid State Div.
FAST NEUTRON IRRADIATION OF PbS AND InSb INFRARED DETECTORS
W. J. Moore, C. S. Guenzer, N. D. Wilsey, and B. Molnar Mar. 1974 31 p refs
(NRL Proj. E02-05)
(AD-777676; NRL-MR-2770) Avail: NTIS CSCL 17/5

The effects of fast neutron irradiations on lead sulfide and indium antimonide infrared detectors is reported. A threshold for lead sulfide detectors has been established at 2 x 10 to the 12th power n/sq cm with approximately 75% of the degradation attributable to a reduction in majority carrier lifetime. When stored at 300K, the detectors return to their original condition in tens to hundreds of days. Restoration of signal proceeds logarithmically with time rather than exponentially as is usually observed. For indium antimonide photovoltaic detectors, a threshold of 2 x 10 to the 11th power n/sq cm has been observed. Measurements show that neutron irradiations produce both an increase in noise and a decrease in signal. These effects result from a decrease in (1) the leakage resistance, (2) the effective carrier lifetime in the depletion region and (3) the hole diffusion length in the base region. Author (GRA)

N74-30128# California Inst. of Tech., Pasadena.
THE WAVELENGTH DIVERSITY OF SPECKLE
Nicholas George and Atul Jain Jan. 1974 34 p refs
(Grant AF-AFOSR-2234-72; AF Proj. 9768)
(AD-778436; AFOSR-74-0604TR; SR-16) Avail: NTIS CSCL 20/6

A unified analysis is presented for the spatial and the spectral sensitivity of speckle (the rapid spatial variations which occur in an image when illumination of narrow spectral width is used) in a space-invariant linear system. In prior work considering speckle size, others have shown that its spatial variation is functionally dependent primarily on the autocorrelation function of the system's impulse response, but effects of varying the frequency were largely ignored. In the present the general problem is treated in which a diffuse object, illuminated by a collimated, monochromatic beam, is imaged by a system whose amplitude impulse response is z(x,nu), where x and nu are a space and normalized frequency coordinates, respectively. Examples are presented; and it is shown that one can infer valuable information about the variation of heights for points on the surface of the input diffuse object which are separated by much less than the classical resolution limit. (Modified author abstract) GRA

N74-30129# Hughes Research Labs., Malibu, Calif.
COHERENT OPTICAL ADAPTIVE TECHNIQUES (COAT) Quarterly Technical Report, 27 Sep. - 26 Dec. 1973
W. B. Bridges, S. Hensen, L. S. Horwitz, R. M. Kubo, and S. P. Lazarra Jan. 1974 81 p
(Contract F30602-73-C-0248)
(AD-779668; RADC-TR-74-108; QTR-3) Avail: NTIS CSCL 17/8

Coherent optical adaptive techniques (COAT) are designed to overcome the distortions experienced by optical beams propagating in a turbulent atmosphere. The report covers the conclusion of the fabrication phase and the start of the calibration of an experimental eighteen-element, self-adaptive, visible optical phased array. Computer simulation results are presented which define optimum AGC performance and which show initial predictions of how the 18-element system will perform. A propagation range complete with a target simulator and associated diagnostics has been constructed for atmospheric measurements with the visible system, and detailed test procedures have been developed. (Modified author abstract) GRA

N74-30130# International Business Machines Corp., San Jose, Calif. Research Lab.
A STUDY OF LASER SCATTERING AND THE DYNAMIC PROPERTIES OF MAGNETIC SOLIDS Final Report, 1 May 1971 - 31 Dec. 1973
Roger M. Macfarlane 18 Feb. 1974 63 p refs
(Contract F44620-71-C-0081)
(AD-779741; AFOSR-74-0774TR) Avail: NTIS CSCL 20/12

Inelastic laser scattering and resonant optical pumping techniques have been used to study relaxation processes in magnetic solids. Large cross section light scattering has been observed from orbital excitations in FeF2 and this has enabled Debye-Waller factors to be measured. A new mechanism of optical phonon relaxation in which the phonon decays resonantly into a pair of magnetic excitations has been proposed to explain anomalous relaxation in CoF2 and some evidence of it found in RbNiF3. Resonant optical pumping has been used to measure the loss of phase memory of optical excitations in MnF2 and a search made for resonantly enhanced two-photon absorption in CdS. Resonant enhancement of the Raman scattering cross section has been observed in the paramagnetic D-band semiconductor FeS2. Author (GRA)

N74-30131# Lincoln Lab., Mass. Inst. of Tech., Lexington.
BALLISTIC VEHICLE LWIR SIGNATURE PREDICTIONS
Barry W. Bryant, Donna M. Edwards, and Robert J. Hull 10 May 1974 43 p refs
(Contract F19628-73-C-0002; AF Proj. 627A)
(AD-779688; TN-1974-22; ESD-TR-74-207) Avail: NTIS CSCL 17/5

The purpose of this note is to describe the equations used

for optical signature prediction of an object in the exoatmosphere, the approximations introduced, and the resulting accuracy of the computations. The signature of an object in a ballistic trajectory about the earth is calculated as seen by either a stationary or a moving observer. The computer porgrams written to support these calculations have been used to date to generate pre-flight signatures for an ICBM flight and post-flight analysis of a WSMR sounding rocket flight. Author (GRA)

N74-30132# Texas Univ., Austin. Applied Research Labs.
PROPAGATION OF PLANE ACOUSTIC NOISE OF FINITE AMPLITUDE
Frederick M. Pestorius Aug. 1973 238 p refs
(Contracts F44620-71-C-0015; N00014-70-A-0166-0004; N00024-72-C-1380-0007; AF Proj. 9781)
(AD-778868; ARL-TR-73-23; AFOSR-74-0711TR) Avail: NTIS CSCL 20/1

The author investigates the propagation in air of plane finite-amplitude noise waves. The reported research is both theoretical and experimental, and the results obtained are valid both before and after shock formation. In the theoretical portion of the work, a new model called modified weak-shock theory is discussed. In this model the effects of ordinary weak-shock theory and Kirchhoff tube wall attenuation and dispersion are combined. The inclusion of tube wall effects is necessary because the experimental work is done in a pipe. The modified weak-shock theory is implemented in a computer algorithm. (Modified author abstract) GRA

N74-30133# Naval Air Development Center, Warminster, Pa. Aero-Electronic Technology Dept.
THE VALIDITY OF OBTAINING THE TOTAL ATTENUATION COEFFICIENT BY ADDING THE COEFFICIENTS OF ABSORPTION AND SCATTERING
Cyrus Beck 25 Apr. 1974 12 p refs
(AD-779003; NADC-74050-20) Avail: NTIS CSCL 20/6

Though the notion is firmly established that alpha, the total attenuation coefficient, consisting of the absorption coefficient, a, plus the scattering coefficient, s, should be used in the exponential attenuation law I=(I sub zero)(e to the minus alpha x power) for light transmission, the practice is shown to be incorrect. Evidence is presented that not only can alpha not be used properly in the exponential attenuation law as is customary but no attenuation law is possible in which alpha = (a + s) can be used correctly, at least for shallow angle scattering and, although not shown, probably not for any kind of scattering. Author (GRA)

N74-30134# ARO, Inc., Arnold Air Force Station, Tenn.
AN INVESTIGATION OF INFRARED DIFFUSER SURFACES Final Report, 1 Jan. 1972 - 30 Jun. 1973
B. E. Wood and A. M. Smith AEDC May 1974 27 p refs
(AD-779771; ARO-VKF-TR-74-9; AEDC-TR-74-22) Avail: NTIS CSCL 20/6

A study of several possible infrared diffuser surfaces has been carried out for near-normal (psi = 10 deg) incident radiation. Gold-coated grit surfaces, chemically etched aluminum, powdered sodium chloride, sulfur, magnesium oxide, and beaded surfaces were investigated using infrared bandpass filters. Angular distribution measurements of reflected radiation were made for the following infrared wavelength intervals: lambda < 1.4, 7.5 to 14.5, 11.8 to 15.5, 14.0 to 23, and 19.1 to 22.5 micrometers. Of all the surfaces investigated, it appears that powdered salt coatings are the most uniform and come closest to being a Lambert surface for infrared radiation. The gold-coated grit surfaces and the chemically etched aluminum also diffuse the infrared radiation somewhat but are nonuniform when viewed on a small scale. Author (GRA)

N74-30135# Maryland Univ., College Park. Computer Science Center.
SOME BASIC EDGE DETECTION TECHNIQUES Interim Report
E. J. Carton, J. S. Weszka, J. M. Mohr, and A. Rosenfeld Dec. 1973 18 p refs
(Contract F44620-72-C-0062)
(AD-778417; TR-277; AFOSR-74-0627TR) Avail: NTIS CSCL 09/2

The report documents a collection of basic techniques for extracting edges of objects. Included are several varieties of gradient operations; the Laplacian; high-pass spatial frequency filtering; and gray level contouring. Examples of the results obtained using these programs are given. Author (GRA)

N74-29828* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF SPECTRA OF ACOUSTICAL SIGNALS AT THE OUTLET OF A NONLINEAR SYSTEM UNDER THE ACTION OF THE SUM OF THE HARMONIC SOURCES
Yu. D. Sverkunov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 145-149 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichеskim Protsessam" Kaunas, KPI Press, 1972 p 131-134 (For availability see N74-29785 19-15)
CSCL 20A

N74-29830* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF BISPECTRA FOR PURPOSES OF ACOUSTICAL DIAGNOSTICS
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 154-156 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakustichеskim Protsessam" Kaunas, KPI Press, 1972 p 139-141 (For availability see N74-29785 19-15)
CSCL 20A

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-30136 National Bureau of Standards, Washington, D.C.
TABLES OF COLLISION INTEGRALS AND SECOND VIRIAL COEFFICIENTS FOR THE (m,6,8) INTERMOLECULAR POTENTIAL FUNCTION
Max Klein, H. J. M. Hanley, Francis J. Smith (Queen's Univ., Belfast), and Paul Holland Jun. 1974 157 p refs Sponsored in part by AEDC
(NSRDS-NBS-47; LC-73-600059) Avail: SOD HC $1.90 as C13.48:47

Values of the repulsive exponent m are included which range in unit steps from m=9 through m=18. Approximately 6 values of the parameter, gamma associated with the inverse eighth power term, are included for each value of m. These tables are equivalent, therefore, to tables for 60 three-parameter (m, 6) potential functions. Comparisons of our results for m=12 and gamma = 0 (corresponding to the (12, 6) function) were made with other calculations. Based on these comparisons, the accuracy of the present calculation is two or three parts in 10,000 depending on the temperature. A table is included which contains the Boyle temperature, the Boyle volume, and the radio of the intermolecular separation at the potential minimum to the separation at the zero of the potential. Author

N74-30137# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELECTRON-SOLID INELASTIC INTERACTION FOR LOW ENERGY ELECTRONS
Andre Verdier 1973 107 p refs In FRENCH; ENGLISH summary
(Pub-154) Avail: NTIS HC $8.50

A magnetic deflection spectrometer was designed which permits the study of the interaction of low energy electrons (energy between 0 and 2000 eV) with solid surfaces. The surface is bombarded at quasi normal incidence, and the emitted electrons are collected by an immersion objective which eliminates the diffracted beams other than the 00 beam. Energy resolution of the analysis is 0.9 eV, whatever the incident electron energy. The study of characteristic energy losses permitted the establish-

ment of two fundamental results: (1) the material thickness interacting with incident electrons is 8 to 10 atomic layers; and (2) the coupling between elastic and inelastic diffusion is not liable to a simple description, as in the case of graphite. Author

N74-30138# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
CONFIGURATION MIXING AND DEEP INELASTIC SCATTERING OF POLARIZED LEPTONS BY POLARIZED NUCLEONS
A. LeYaouanc, L. Oliver, O. Pene, and J. C. Raynal Mar. 1974 22 p refs
(LPTHE-74/19) Avail: NTIS HC $4.25

A quark model was considered in which a large configuration mixing of the direct product of SU (3) and SU (3) appears at P sub z = infinity as a relativistic effect due to the high internal velocities for quarks inside hadrons. The mixing describes the relative alignment between the nucleon helicity and the helicities of the quarks. Calculation of the spin dependent effect in deep inelastic scattering of a polarized lepton (electron or muon) by a polarized nucleon was attempted taking into account the large mixing in question. The results are expressed in terms of the direct product of SU (3) and SU (3) mixing parameters. The singlet contribution is expressed in terms of the F, D couplings of the low-lying octet axial matrix elements. The spin part of the wave function at rest is expressed in terms of free Dirac spinors, and F/D = 2/3, so that a large positive proton asymmetry and a null asymmetry for the neutron can be predicted. Author

N74-30139# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
STRING MODEL WITH BARYONS: TOPOLOGY, CLASSICAL MOTION
X. Artru May 1974 31 p refs
(LPTHE-74/24) Avail: NTIS HC $4.75

A model is considered in which a meson is an open string with a quark at one end and an anti-quark at the other end, a baryon is made of three strings joining at a point, and carrying quarks at their free ends. The triality condition is ensured by orienting the strings according to simple rules. These rules suggest the existence of an underlying magnetic monopole theory. The topological properties on the model are investigated by looking at the duality diagrams: existence of exotic hadrons, of five basic interactions between strings. Some renormalization diagrams are assigned a negative power of the Veneziano coupling constant. Then, taking the same action (the world-sheet area) as in the conventional string model, the equations of motion of a junction are given. It was argued that the slope of the leading baryonic Regge trajectory is the same as that for the mesons. As an example of an application, the sticking together of two colliding strings was studied; it was found that it is classically forbidden at relative velocities greater than (6/7) to the 1/2 power.
Author

N74-30140# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
INTRODUCTION TO WEAK NEUTRAL CURRENTS
Pierre Fayet Mar. 1974 23 p refs Presented at the 9th Rencontre de Moriond sur les Interactions Electromagnetiques, Mar. 1974
Avail: NTIS HC $4.25

The question of weak neutral currents was discussed in connection with the unified gauge theories of weak and electromagnetic interactions. Author

N74-30141# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
A POSSIBLE EXPLANATION OF THE SHRINKING OF DIFFRACTION PEAKS: COMPLEX POLES AND THE CHOU AND YANG MODEL
R. Hong Tuan May 1974 13 p refs
(LPTHE-74/23) Avail: NTIS HC $4.00

The observed shrinking of the proton-proton diffraction peak is interpreted as a combined effect of a fixed Pomeron (as in geometrical models) and of complex poles representing the s-channel effects (like heavy pairs production for example). Asymptotically, the model reduces to that of Chou and Yang, the shrinking is expected to stop at approximately 10 to the 5th power Gev and the proton-proton total cross section never bypasses 46.5 mb. Author

N74-30142# Laboratoire de Physique Theorique et des Hautes Energies, Orsay (France).
GAMMA POLARISATION IN N + P YIELDS Y + D REACTION DUE TO WEAK PARITY-VIOLATING EFFECTS
J. Micheli and D. Pignon May 1974 63 p refs
(LPTHE-74/16) Avail: NTIS HC $6.25

The effect of parity-violating weak interactions on the polarization of the photon in the thermal neutron capture are presented. First, neglecting the initial state interaction, a relativistic calculation is made at threshold. Then, in order to calculate the initial state interaction, the phase-shift is used directly and a potential description for the nucleon-nucleon interaction is avoided. A detailed discussion of the approximations made in the calculation, and in particular, of the effects due to short-range uncertainties in the deuteron wave-function. Results are smaller than the experimental result by an order of magnitude, but are higher than most of the other theoretical calculations. Author

N74-30143# Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
CONSTRAINTS AND GAUGE TRANSFORMATIONS
A. Frenkel Jun. 1974 48 p refs
(LPTPE-74/20) Avail: NTIS HC $5.50

It is shown that in the Hamiltonian formalism, with constraints derived from a singular Lagrangean, all the first class constraints are generators of infinitesimal gauge transformations. The functional dependence of the Lagrangean on the coordinates and on the velocities is not restricted except for smoothness conditions. Following the procedure shown, the proof is given for a non-quantized Lagrangean with a finite number of coordinates. The extension to relativistic field theories should be attempted at on the lines indicated. Author

N74-30144*# Techtran Corp., Glen Burnie, Md.
COMPTON SCATTERING INDUCED BY RELATIVISTIC ELECTRONS
Yu. P. Chelkov and V. M. Charugin Washington NASA Jul. 1974 16 p refs Transl. into ENGLISH of "Indutsirovannoye Komptonovskoye Rasseyaniye Relyativistskimi Elektronami", Acad. of Sci. USSR, Moscow, report Pr-144, 1974 p 7-21
(Contract NASw-2485)
(NASA-TT-F-15765; PR-144) Avail: NTIS HC $4.00 CSCL 20H

A study is made of induced Compton scattering by relativistic electrons as a process playing a role in high luminosity cosmic sources, and of the influence of such scattering on the radiation spectrum and energy losses of electrons. Consideration is confined to isotropic radiation and electron distribution and to the classic Thompson approximation. Author

N74-30145# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Festkoerperforschung.
MAGNETIC FLUX LINE PINNING IN NbTaBX Nb2N PRECIPITATION
G. Antesberger Aug. 1973 90 p refs In GERMAN
(JUL-994-FF) Avail: AEC Depository Libraries HC $6.50

The pinning of magnetic flux lines in a system (NbTa + Nb2 precipitations) whose superconducting properties and metallurgical structure have been known from X-ray measurements and investigations with the electron microscope is investigated. Based on this information and experimentally determined values for the volume pinning force it has been possible to draw conclusions as to the interaction between a single flux line and a single precipitation of normal conductivity. NSA

N74-30146# Ohio State Univ., Columbus.
ELECTROMIGRATION IN METALLIC SYSTEMS
D. A. Rigney 29 May 1973 82 p refs Presented at the meeting of the Am. Inst. of Mining, Met. and Petrol. Engr., Philadelphia, 29-30 May 1973
(COO-2037-18; Conf-730554-3) Avail: NTIS HC $5.75

The more likely contributions to electromigration in metallic single crystals and polycrystals are briefly discussed. These include such factors as driving force, diffusion, and local binding energy. The driving force is particularly emphasized, especially in liquid

alloys. Such systems are thought to be simpler than the corresponding solid alloys, which present complications due to the details of crystalline and defect structure. A simple scattering approach is described and applied to selected liquid alloy systems. Implications for controlling electromigration in such practical devices as those based on thin film circuits are considered. Author (NSA)

N74-30147# New York Univ., N.Y. Magneto-Fluid Dynamics Div.
BOLTZMANN COLLISION OPERATOR WITH INVERSE-POWER INTERMOLECULAR POTENTIALS Interim Report
Young-Ping Pao Jan. 1974 71 p refs
(Grant AF-AFOSR-2053-71; AF Proj. 9749)
(AD-778961; MF-74; AFOSR-74-0739TR) Avail: NTIS CSCL 07/4

This report studies the linearized collision operator in the Boltzman equation with repulsive intermolecular potentials V(r) = ar/alpha. It is shown that for alpha greater than 2 the collison operator has a purely discrete spectrum and its eigenfunctions are infinitely differentiable L2-functions which are complete in L2. The proof relies on the formalism of pseudo-differential operators. The report contains two parts: Part 1 deals with the special case of alpha = 4, the Maxwell's molecules, while Part 2 considers the general case inverse power potentials with alpha greater than 2. Author (GRA)

N74-30148# Naval Research Lab., Washington, D.C.
ELECTRON IMPACT CROSS-SECTIONS AND RATES FOR ONE AND TWO ELECTRON ALUMINUM IONS Interim Report
E. Oran and J. Davis Apr. 1974 17 p refs
(NRL Proj. 77H02-30)
(AD-778024; NRL-MR-2694) Avail: NTIS CSCL 07/4

A semi-classical impact parameter method has been used to calculate the gaunt factors, cross-sections, and rates for electron impact excitations between selected states of the hydrogen-and helium-like ions of aluminum. These results are compared to the universal values suggested by Allen. For the resonance transitions, agreement with Allen's values becomes worse as the charge on the target increases. Agreement is good for the nonresonant transitions. Author (GRA)

N74-30149# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
ON THE COUPLING BETWEEN VIBRATIONAL RELAXATION AND MOLECULAR ELECTRONIC TRANSITIONS
Abraham Nitzan Mar. 1974 27 p refs Prepared in cooperation with MIT
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-778624; SQUID-TR-MIT-80-PU) Avail: NTIS CSCL 07/4

Vibrational relaxation of a harmonic molecule in contact with its surrounding medium is studied, and its effect on the electronic relaxation rate in such molecules is examined. Results of earlier works which considered harmonic phonon models for the medium are extended to the case of a general thermal bath. The formal expression for the vibrational relaxation rate is modified but the general form of the final results for the electronic and vibrational time evolution is shown to remain intact. Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-30150 Nebraska Univ., Lincoln.
MAGNETOHYDRODYNAMIC DUCT FLOW Ph.D. Thesis
Howard Shinya Izawa 1973 204 p
Avail: Univ. Microfilms Order No. 74-12991

The study of magnetohydrodynamic duct flow is divided into three sections: magnetohydrodynamic entrance flow through the ducts of parallel plates, straight duct flow by Kantorovich's variational method, and duct flow with sectorial cross-section with an applied current at the center. In the magnetohydrodynamic entrance flow, the nonlinear inertia term of the governing equation is linearized by using two undetermined functions. Numerical calculations are carried out for symmetric and asymmetric flow configurations which consist of one or more jets with Hartmann numbers from 0 to 8. In straight duct flow using Kantorovich's variational principle, solutions are obtained by extremizing a certain integral with the help of a trail function. The velocities and induced magnetic fields are plotted. Finite Fourier transforms are used to solve problems of duct flow with sectorial cross and applied current. Dissert. Abstr.

N74-30151# Georgia Inst. of Tech., Atlanta.
RADIATION TEMPERATURE PROFILES IN AN RF PLASMA OVER A WIDE RANGE OF APPLIED MAGNETIC FLUX INTENSITIES; THEORY AND EXPERIMENT Ph.D. Thesis
Steven Douglas Thompson 1974 142 p
Avail: Univ. Microfilms Order No. 74-16141

The numerical techniques and approximate analytical closed form solutions of the energy balance equation and Maxwell's equations used to describe the plasma require a knowledge of the electric and magnetic field values at the plasma radius and the coil geometry. The only comparisons of theoretical solutions with experimental results to date were indirect comparisons based on reported power requirements. Measurements of the temperature profiles in an RF argon plasma were made over magnetic field intensities ranging from 20 amp turns/cm to 80 amp turns/cm. The results were compared with a one dimensional numerical treatment of the governing equations and with an approximate closed form analytical solution that neglected radiation losses. Dissert. Abstr.

N74-30152 Texas Univ., Austin.
STELLARATOR CONFINEMENT OF LASER PRODUCED PLASMA Ph.D. Thesis
Charles Martin Scott 1974 132 p
Avail: Univ. Microfilms Order No. 74-14763

A closed confinement system, a small stellarator, was filled with laser produced plasma. The plasma was produced using a Q-switched ruby laser delivering a 2 Joule, 15 nanosecond pulse, focused onto approximately 200 microns of a large LiH chip located outside the separatrix, the last closed magnetic surface. Plasma properties were obtained with a double Langmuir probe and a 4 mm microwave interferometer. Plasma confinement time was then studied as a function of the ratio of the helical to toroidal winding currents. Electron temperatures and densities on the order of 10 eV and 10 to the 13th power cu/cm were obtained and confined with a magnetic field of approximately 7 kg for about 300 microseconds. Dissert. Abstr.

N74-30153 Rochester Univ., N.Y.
X-RAY EMISSION AND IONIZATION DYNAMICS OF LASER PRODUCED PLASMAS Ph.D. Thesis
Thomas Charles Bristow 1974 146 p
Avail: Univ. Microfilms Order No. 74-14384

The time history of conversion of input laser radiation to output soft X-rays from an oxygen-doped, spherical, laser produced plasma is calculated. Included is a calculation using a series of rate equations to describe the ionization dynamics of the impurity ions. The enhanced absorption due to the impurities of oxygen and argon is calculated, and a comparison made with the extra radiation from the impurities. Experimental measurements show, in some cases, an electron temperature between 800 eV and 1.2 KeV with a Maxwellian velocity distribution of electrons. These measurements agree favorably with the results of the numerical program. For the non-Maxwellian cases, a two temperature calculation yields temperatures between 600 eV and 4 KeV, in good agreement with the experimental results. There is no evidence of an appreciable flux of hard X-rays from these experiments. Dissert. Abstr.

N74-30154 California Univ., Irvine.
INSTABILITY AND COUPLING OF LARGE-AMPLITUDE ELECTRON-WAVE SIDEBANDS Ph.D. Thesis
Gary Loren Jahns 1973 192 p
Avail: Univ. Microfilms Order No. 74-13850

A launched large-amplitude electron-plasma wave drives an instability which results in the growth of sideband excitations at nearby frequencies. Measurements of the instability, designed specifically to test the various theories and to render more clear the underlying physical mechanism of the instability, are presented.

Wave dispersion, amplitude development with distance, and spectra are determined empirically as a function of large wave and phase velocity. From these measurements, the following points are examined: (1) the initial development of the instability using launched small-amplitude test waves at the sideband frequencies; (2) the dependence of the growth rate on wave parameters; (3) the behavior at low phase velocities where the large amplitude wave strongly decays; and (4) mode coupling between applied or spontaneous sidebands. Extensive measurements are also presented of the instability growth rate and its dependence on wave dispersion and amplitude parameters.
Dissert. Abstr.

N74-30155 Texas Univ., Arlington.
ANALYSIS OF MHD CHANNEL FLOWS BY A COUPLED CORE FLOW-BOUNDARY LAYER MODEL Ph.D. Thesis
Donald Ray Wilson 1973 201 p
Avail: Univ. Microfilms Order No. 74-15055

A general method of analyzing the performance of MHD channel flows was developed that is based on a coupled core flow-boundary layer model. The method is capable of predicting the overall gasdynamic, thermal, and electrical performance of both MHD generators and accelerators operating in either the Hall or Faraday mode. The quasi-one-dimensional MHD channel flow equations are solved simultaneously with the integral momentum and energy equations for the magnetic field wall. An electrical shorting model is developed that considers both axial and transverse shorting through the boundary layer and the external facility. The profile calculations required in the integration of the boundary layer equations were evaluated by either a two-layer model that allows the thermal and viscous boundary layers to develop at different growth rates, or a single-layer model in which the two layers are assumed to be of identical thickness. Dissert. Abstr.

N74-30156* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MEASUREMENT OF PLASMA TEMPERATURE AND DENSITY USING RADIATION ABSORPTION Patent
Kenneth W. Billman, Paul D. Rowley, James R. Stallcop, and Leroy L. Presley, inventors (to NASA) Issued 18 Jun. 1974 6 p Filed 26 Dec. 1972 Supersedes N73-29750 (11 - 20, p 2458)
(NASA-Case-ARC-10598-1; US-Patent-3,817,622;
US-Patent-Appl-SN-318151; US-Patent-Class-356-73;
US-Patent-Class-356-43; US-Patent-Class-356-85;
US-Patent-Class-356-87; US-Patent-Class-356-201) Avail: US Patent Office CSCL 20I

A procedure, using a light beam of predetermined wavelength, preferably monochromatic, for measuring plasma characteristics is presented. Light absorbed by the plasma is used to obtain an absorption coefficient for the plasma. From this known coefficient and independent measurement of either the electron density or temperature of the plasma, an equation may be solved to obtain other unknown quantities. In this procedure, the absorption coefficient of the plasma is derived simultaneously for two probing light beams of substantially different predetermined wavelengths. These two coefficients are used to solve the two equations, which are in turn used to determine plasma electron density and temperature.
Official Gazette of the U.S. Patent Office

N74-30157# Technische Hogeschool, Eindhoven (Netherlands).
RELAXATION PHENOMENA IN AN MHD GENERATOR WITH PRE-IONIZER Ph.D Thesis
Johannes Hendrik Blom 11 Sep. 1973 146 p refs
Avail: NTIS HC $10.50

A theoretical and experimental investigation was made of the relaxation processes in magnetohydrodynamic (MHD) generators by correlating the calculations of the relaxation process in a two-dimensional geometry with the configuration of pre-ionizers with respect to the maximum efficiency. The time-dependent behavior of discharges in pre-ionizers and in a periodic generator segment were studies using two-dimensional time-dependent calculations. A model for the calculation of the power output and efficiency of MHD generators was derived. A shock tunnel was built which delivered a plasma with the desired parameters for studying the relaxation processes in an MHD generator with an enthalpy input of five MW. The results show that the increase in the electron density due to pre-ionization is in agreement with a quasi-one-dimensional theory. The experimental efficiencies for pre-ionization ranged from 10 percent to 30 percent. Current distributions determined from measurements with electrostatic probes and high speed photography showed a qualititative agreement with the theoretical results. Author

N74-30158# Technische Hogeschool, Eindhoven (Netherlands).
LOSS MECHANISMS IN AN MHD GENERATOR Ph.D Thesis
Joannes Wilhelmus Maria Antonius Houben 25 Sep. 1973 164 p refs
Avail: NTIS HC $11.25

Loss mechanisms in a nonequilibrium Faraday type MHD generator are studied. To study the interaction of such losses, an equivalent resistance model was developed. In this model, losses are represented by resistances which are loads for the bulk of the MHD generator. The basic equations are given. Using these equations, the influence of the electrode configuration on the performance of a linear, nonequilibrium, Faraday type MHD generator is calculated numerically. It is shown that rod electrodes positioned in the flow yield better generator performance than flat electrodes at the generator wall. Experiments were carried out in a cesium-seeded argon plasma created by a shock tunnel operating in tailored interface mode. Diagnostic methods are described by which it is possible to measure parameters of the shocktunnel created plasma in a direct and independent way: electrostatic probes, spectroscopy, microwaves, hotfilms, piezoelectric crystals, and anemometry. Experimental results are discussed and compared with theoretical predictions. Author

N74-30159# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
PARAMETRIC INSTABILITIES OF ORDINARY AND HYBRID WAVES
Nguyen The Hung May 1974 19 p refs Sponsored in part by Swiss Natl. Sci. Foundation
(LRP-80/74) Avail: NTIS HC $4.00

Coupled equations for ordinary and hybrid waves, propagating perpendicular to a static magnetic field, are derived within the fluid approximation. It is shown that a large amplitude ordinary wave is subject to a decay instability as well as a modulational instability. The latter corresponds to a modulation of the pump amplitude, and the excitation of a long wave length hybrid wave. Characteristic quantities, such as the threshold intensity and the maximum growth rate, are calculated for various cases. In the limit of a vanishing magnetic field, the results for stimulated Raman and Brillouin scattering are recovered. Author

N74-30160# Ecole Polytechnique Federale de Lausanne (Switzerland).
PLASMA WAVE EXPERIMENT: A PRESENTATION OF THE DEVICE AND FIRST EXPERIMENTAL RESULTS
M. Bitter and P. J. Paris May 1974 31 p refs Presented at Reunion de la Soc. Suisse de Phys., Berne, Switzerland, 26-27 Apr. 1974
(LRP-82/74) Avail: NTIS HC $4.75

A device is described for producing stationary or pulsed collisionless low-beta-plasmas for use in investigating the collective motions of free streaming electrons. Results concerning the plasma diagnostics with Bernstein waves are reported along with the observations of instabilities produced by a double humped electron velocity distribution. F.O.S.

N74-30161*# Scientific Translation Service, Santa Barbara, Calif.
PLASMA INSTABILITIES AND MODEL RADIO AURORA
A. V. Volosevich, V. A. Liperovskiy, and Yu. L. Sverdlov Washington NASA Jul. 1974 49 p refs Transl. into ENGLISH of "Plazmennye Neustoychivosti i Model' Radioavrory" Moscow, USSR Acad. of Sci., Preprint No. 153, 1974 47 p
(Contract NASw-2483)
(NASA-TT-F-15675; Preprint-153) Avail: NTIS HC $5.50 CSCL 20I

Theoretical work dealing with the possible types of plasma instabilities associated with currents, fluxes of incoming particles, and electron density gradients is discussed with reference to

the polar ionosphere. The theory developed up to the present time explains in general terms the properties of the observed radio reflections. Author

N74-30162*# Stanford Univ., Calif. Inst. for Plasma Research.
THEORETICAL AND EXPERIMENTAL STUDIES OF SPACE-RELATED PLASMA WAVE PROPAGATION AND RESONANCE PHENOMENA Semiannual Report, 1 Jan. - 30 Jun. 1974
F. W. Crawford Jul. 1974 25 p refs
(Grant NGL-05-020-176)
(NASA-CR-139275; SU-IPR-580; SAR-15) Avail: NTIS HC $4.25 CSCL 20I

Active research is reported in the following areas: (1) whistler propagation; (2) whistler triggered VLF emissions; (3) Alfven wave excitation; (4) helical electron beams for whistler generation; and (5) ULF excitation by metallic electric or magnetic dipole antennas. G.G.

N74-30163# California Univ., Los Angeles.
LASER HEATING OF UNDER-DENSE MAGNETIZED PLASMA
F. F. Chen Nov. 1973 15 p refs
(Contract AT(04-3)-34)
(UCLA-34-P-157-X-6; PELR-10; UCLA-ENG-7385) Avail: NTIS HC $3.00

In experiments on nonlinear effects induced by high-powered CO2-laser pulses impinging on a magnetically confined plasma target, the temperature of the plasma is raised by resistive heating. Typical targets are theta pinches and magnetically confined arcs. Since the thresholds for nonlinear phenomena depend on electron temperature, the change in electron temperature caused by the laser beam itself is calculated. The temperature is limited in the steady state by heat conduction transverse. Axially directed gigawatt beams can heat the plasma to an equilibrium temperature of several tens of eV independently of density, but that, in practice, this equilibrium temperature is not reached because of the finite duration of the laser pulse and possibly also because of inelastic collisions with partially ionized ions. Author (NSA)

N74-30164# Nagoya Univ. (Japan).
PROCEEDINGS OF THE MEETING ON PLASMA AND CONTROLLED THERMONUCLEAR FUSION, 4
Feb. 1973 246 p refs Partly in JAPANESE; partly in ENGLISH
Meeting held at Nagoya, Japan, 1 Feb. 1972
(IPPJ-DT-36) Avail: NTIS

The design of a solenoid magnetic coil system for experiments on turbulent heating of plasma is presented. Radial expansion of the coils due to high magnetic pressure (50 atm.) is suppressed by the conductor of the coil and epoxy resin plus FRP (fiber reinforced plastics) by a filament-winding method. The dimensions of the coil system are inner diameter 25 cm, outer diameter 33 cm, and length 200 cm. Uniformity of the field on the axis is less than 5%. By using a 288-kJ condenser bank, the strength of the field is 25 kG with a period of 12 msec. The mechanical strength limits the field strength to 50 kG. Author (NSA)

N74-30165# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Plasmaphysik.
PRODUCTION OF HIGHLY IONIZED PLASMA AT LOW GAS PRESSURES
K. Chandrakar Nov. 1973 16 p refs
(JUL-1025-PP) Avail: AEC Depository Libraries $3.00

A fully ionized plasma was produced in a quartz tube with two plane parallel electrodes 30 cm apart and 8 cm in diameter in hydrogen. It was done by first starting a sliding spark between the cathode and an auxiliary electrode near the cathode by applying a voltage pulse of 200 ns duration and then applying the main voltage pulse of 3/us. The spatial and temporal growth of the discharge were studied by observing 8 mm microwave interferograms at three points along the length of the discharge tube and by photographing the discharge. It was found that in hydrogen the time delay between the application of the main voltage and the starting of the discharge current remained nearly constant at $p < 0.0001$ torr and then it decreased with increasing p. Similar results were obtained when the tube was filled with helium and neon. The photographs of the discharge showed some instability in the plasma; but when a magnetic field of 2 kG was applied the instabilities decreased noticeably. Author (NSA)

N74-30166# Princeton Univ., N.J.
ROLE OF IMPURITIES IN THE PRESENT TOKAMAK EXPERIMENTS
V. A. Vershkov and S. V. Mirnov 1973 47 p refs Transl. into ENGLISH from Inst. of Atomic Energy report IAE-2298 (Moscow), 1973
(Contract AT(11-1)-3073)
(MATT-Trans-113; IAE-2298) Avail: NTIS HC $4.50

Effects caused by multicharged impurities in the Tokamak plasma are discussed. Their first effect is the cooling of the column periphery by line radiation. This leads to the peaking of the conductivity profile and correspondingly of the current density. A competing process, producing flattening or even a skin current can be due to the concentration of highly ionized impurities at the axis of the column. Conclusions concerning the behavior of impurities at the center are drawn from measurements of soft X-ray radiation (3 to 10 keV). It was found that the increase of the impurity concentration can be halted by the development of plasma instabilities, specifically of the kink and disruptive types. The importance of impurities in the profile formation, must increase with increasing pulse duration. At a certain level this may produce a decrease of the thermoisolation and column stability. Author (NSA)

N74-30167# Princeton Univ., N.J.
PLASMA BEHAVIOR WITH LARGE DISCHARGE CURRENTS IN TOKAMAK-4
V. A. Vershkov, C. E. Lisenko, I. B. Semenov, and A. F. Scherbak 1973 23 p refs Transl. into ENGLISH from Inst. of Atomic Energy report IAE-2291 (Moscow), 1973
(Contract AT(11-1)-3073)
(MATT-Trans-112; IAE-2291) Avail: NTIS HC $3.25

Results of experiments with large discharge currents (90 to 240 kA) on Tokamak-4 are reported. It is shown that plasma oscillations can cause loss of particles. The dependence of the energy confinement time on the discharge parameters is presented. It is emphasized that, with an increase in pulse energy, impurities emitted by the limiter have a large effect on the energy balance of the plasma. Author (NSA)

N74-30168# California Univ., Livermore. Lawrence Livermore Lab.
DYNAMICS OF A PLASMA DISCHARGE IN A MIRROR FIELD
E. P. Lee and B. McNamara 24 Jan. 1974 25 p refs
(Contract W-7405-eng-48)
(UCID-16445) Avail: NTIS HC $3.25

A cool plasma discharge in mirror geometry is modeled with ions flowing along field lines into electrodes beyond the throats. The velocity of the flow is determined by the electrode sheath properties and nozzle-like phenomena in the mirror and ion source. This model is applicable to the wet-wood burner reactor and mirror target schemes. Author (NSA)

N74-30169# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
BASIC EQUATIONS AND FUNDAMENTAL DATA FOR COMBUSTION MHD GENERATORS
J. Raeder and R. Buende Jul. 1974 225 p refs In GERMAN; ENGLISH summary
(IPP-IV-60) Avail: AEC Depository Libraries HC $13.25

The basic equations of magnetogasdynamics are summarized. From these general equations a set of stationary one-dimensional flow equations and a simplified Ohm's law are derived for special application to MHD channel flow. The method of calculating the plasma composition, thermodynamic functions and transport properties in general is described and applied to typical combustion MHD generator plasmas. This section also includes a collection of momentum transfer cross-sections for collisions between electrons and heavy particles typical of seeded combustion gases. The next section presents the treatment of turbulent boundary layers and closely related phenomena such

as wall friction, heat losses and electrode drops. In the last section, these methods and data are applied to the calculation of real combustion MHD flows. The main part of this section presents the numerical methods used in our computer program and typical results. Author (NSA)

N74-30170# Oak Ridge National Lab., Tenn. Thermonuclear Div.
PROGRAM IPP6: MICROINSTABILITIES IN INHOMOGENEOUS, MIRROR-CONTAINED PLASMAS
C. O. Beasley, Jr. and H. R. Hicks Jan. 1974 72 p refs
(Contract W-7405-eng-26)
(ORNL-TM-4475) Avail: NTIS HC $5.50

The program IPP6, the program for finding unstable loss-cone modes in a model mirror-contained plasma, is described. The input data are described, the output is explained, and the internal workings of the various subprograms are given. Connection is made with analytical derivation of equations used in formulating the model. Author (NSA)

N74-30171# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Center.
CONTROLLED FUSION AND PLASMA RESEARCH: A LITERATURE SEARCH
M. O. Whitson, comp. Feb. 1974 564 p refs
(TID-3557-S9) Avail: NTIS HC $13.60

The search includes 4348 references on various aspects of plasma physics and controlled thermonuclear research. Report number, corporate author, and subject indexes are included. Author (NSA)

N74-30172# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFLUENCE OF ELECTRIC AND LUMINOUS PHENOMENA OF THE ANODIC REGION ON THE ELECTRIC OSCILLATIONS IN A dc GLOW DISCHARGE
D. Grosu 4 Apr. 1974 62 p refs Transl. into ENGLISH from Acad. Rep. Populare Romine, Studii Cercetari Fiz. (Bucharest), v. 22, no. 6, 1970 p 623-649
(AD-778571; FTD-HC-23-1339-74) Avail: NTIS CSCL 20/9

It is shown that the oxide layer on the anode surface operates like a resistance in the anode region. Electric oscillations, in the case the anode is located in the negative glow or in Faraday dark space, are ionic oscillations of the anodic region. The condition for exciting these oscillations a decrease in the electron resonant efficient section with the increase of ion speed. G.G.

N74-30173# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
TWO-STAGE ACCELERATION OF PLASMA
L. A. Artsimovich 4 Apr. 1974 9 p ref Transl. into ENGLISH from the monograph "Plazmennye Uskoriteli" 1973 p 195-198
(AD-778512; FTD-HT-23-1074-74) Avail: NTIS CSCL 20/9

The operation of a two-step plasma accelerator is explained. E.J.O.

N74-30174# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INVESTIGATION OF THE ACCELERATION OF IONS BY INTENSE ELECTRON FLUXES
N. S. Replaov, N. A. Khizhnyak, A. A. Plyutto, and O. E. Lysneko 8 Apr. 1974 6 p Transl. into ENGLISH from Symp. Kollektivnym Metodam Uskoreniya, Dubna, 1972 p 100-101
(AD-778800; FTD-HT-23-1326-74) Avail: NTIS CSCL 20/9

A simple theoretical model of the acceleration of ions by intense electron fluxes emerging from plasma is proposed. GRA

N74-30175# Naval Research Lab., Washington, D.C.
STIMULATED COMPTON SCATTERING AND SELF-FOCUSING IN THE OUTER REGIONS OF A LASER-FUSION PLASMA
Edward Ott, Wallace M. Manheimer, and H. H. Klein Apr. 1974 22 p refs
(NRL Proj. 77H02-29)
(AD-778992; NRL-MR-2738) Avail: NTIS CSCL 20/9

The collective processes which can occur in the outer regions of a laser fusion plasma are investigated theoretically and with numerical simulations. The most important processes are induced Compton scatter and self-focusing. Compton scatter heats the plasma until the electron thermal velocity is of order of the oscillating velocity in the field of the laser light. The self-focus instability filaments the laser light and modulation of the laser intensity can be as high as fifty percent. Author (GRA)

N74-30176# Informatics, Inc., Rockville, Md.
SOVIET DEVELOPMENTS IN LASER FUSION
Stuart G. Hibben 8 Mar. 1974 145 p refs
(Contract F44620-72-C-0053)
(AD-779749; AFOSR-74-0783TR) Avail: NTIS CSCL 18/1

The report is a collection of abstracts on significant Soviet work in laser fusion, dating from approximately 1969 to the present. The material was selected from the Informatics, Inc. serial publication Bibliography of Soviet Laser Developments, and includes articles directly dealing with fusion as well as related studies by authors active in the fusion field. The abstracts are grouped into experimental studies (plasma kinetics, plasma spectroscopy, laser design), and theoretical studies. A comprehensive bibliography and a first-author index are appended. GRA

N74-30177# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MHD-EFFECTS IN A SHOCK TUBE
R. V. Vasileva and V. R. Petukhov 16 Apr. 1974 16 p refs Transl. into ENGLISH from the monograph "Aerofizicheskie Issledovaniya Sverkhzvukovykh Technenii" 1967 p 121-127
(AD-779619; FTD-HT-23-1978-74) Avail: NTIS CSCL 20/9

Shock tube results are investigated with a magnetic field superimposed perpendicular to the direction of movement of an ionized gas. Argon and xenon were used as the generator gas. The possibility is shown and results are given in the measurement of the velocity of slipstream and induced emf. The magnetic field was generated, and an electromagnet made it possible to vary the magnitude of magnetic induction from 0 to 7000 G. M.C.F.

N74-30178# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ABSOLUTE PARAMETRIC INSTABILITY OF AN INHOMOGENEOUS PLASMA
V. P. Silin and A. N. Starodub 17 Apr. 1974 17 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz. Inst. (USSR), no. 124, 1973 p 1-5
(AD-779622; FTD-HT-23-688-74) Avail: NTIS CSCL 20/9

A plasma which is subjected to the influence of a powerful pumping wave is unstable relative to the build up of plasma high-frequency electronic waves (plasmons); this is caused by the decay of the pumping wave into two plasmons. The article that follows studies the effect of a spatial inhomogeneous plasma on this kind of parametric instability. It has been shown that consideration of the spatial inhomogeneity of the plasma produces two effects: in the first place, plasma inhomogeneity leads to a considerable increase in the threshold of the pumping wave's decay into two high-frequency electron waves and, secondly, are enclosed in the plasma; this corresponds to absolute instability. GRA

N74-30179# Naval Research Lab., Washington, D.C.
HOT-SPOT MODEL OF K-LINE EMISSIONS FROM LASER-HEATED PLASMAS Interim Report
K. G. Whitney and J. Davis Apr. 1974 47 p refs
(AD-779067; NRL-MR-2780) Avail: NTIS CSCL 20/9

A nonhydrodynamic model is developed to describe X-ray emission from laser-heated plasmas on a subnanosecond time scale. The model is first correlated with experiment and then is used to study the conversion efficiency of laser energy to K-line X-rays in carbon, fluorine, and aluminum plasmas as a function of incident laser intensity. It is found that these conversion efficiencies peak at well defined values of input energy per area for laser pulse widths smaller than the pumping time for K-line emission. In this case, the degree and not the rate of plasma heating is important in determining the peak conversion efficiency. It is also found that peak conversion to K-radiation in excess of roughly 10 or 20% occurs only when the C, F, and Al plasmas are optically thick to the K sub alpha lines. Author (GRA)

N74-30180# Air Force Weapons Lab., Kirtland AFB, N.Mex.
MAGNETIC NEUTRALIZATION IN A MODULATED ELECTRON BEAM-PLASMA SYSTEM Final Report, Apr. - Sep. 1973
Robert B. Miller May 1974 50 p refs
(AF Proj. 8809)
(AD-779722; AFWL-TR-73-278) Avail: NTIS CSCL 20/9

The injection of an intense, relativistic electron beam into a plasma is facilitated by counterstreaming plasma electrons which tend to neutralize the self-magnetic field of the electron beam. In the report magnetic neutralization is examined for the case of injection of a modulated electron beam into a plasma. Analytical expressions are derived and compared with the unmodulated beam case. Author (GRA)

N74-30181# Air Force Weapons Lab., Kirtland AFB, N.Mex.
TWO SYSTEMS FOR MEASUREMENT OF HIGH INTENSITY VACUUM ULTRAVIOLET PLASMA RADIATION Final Report, Jul. 1972 - Jan. 1974
David J. Johnson May 1974 37 p refs
(AF Proj. 8809)
(AD-779757; AFWL-TR-74-43) Avail: NTIS CSCL 20/9

An X-ray diode is presented for measurement of vacuum ultraviolet (UV) plasma emission on a nanosecond time basis. Response curves for the diode are obtained via a first-order photoelectric emission model. A windowless ionization chamber system is presented which is designed for use as a vacuum UV calorimeter. The response curves for this system are also obtained via a first order theoretical model. Author (GRA)

N74-30182# Naval Research Lab., Washington, D.C.
ANGULAR MOMENTUM CONSTANT OF A TWO-DIMENSIONAL GUIDING-CENTER PLASMA Interim Report
D. L. Book May 1974 9 p refs
(AD-779272; NRL-MR-2804) Avail: NTIS CSCL 20/9

A constant of the guiding-center motion of a two-dimensional plasma is displayed and applied to the statistical mechanics of negative temperature states. Author (GRA)

N74-30183# Case Western Reserve Univ., Cleveland, Ohio. School of Engineering.
LASER HEATING IN A DENSE PLASMA FOCUS Interim Report
Osman K. Mawardi 31 Mar. 1974 10 p refs
(Grant AF-AFOSR-1889-70; AF Proj. 9752)
(AD-779042; AFOSR-74-0716TR) Avail: NTIS CSCL 20/9

The report is divided in two parts. In the first part an account is given of the measurement of the momentum distribution of the deuterons ejected from a dense plasma focus. The results show the existence of a pronounced non-Maxwellian distribution and a small population of deuterons accelerated to the voltage of the condenser bank. In the second part theoretical calculation of laser heating establish the presence of large density gradient which probably accounts for the large currents detected in such plasmas. Author (GRA)

N74-30184# Naval Research Lab., Washington, D.C.
A COHERENT NONLINEAR THEORY OF A CYCLOTRON INSTABILITY Interim Report
P. Sprangle and Wallace M. Manheimer Apr. 1974 33 p refs
(AD-779263; NRL-MR-2784) Avail: NTIS CSCL 20/9

A general nonlinear theory of coherent instabilities is presented and applied to the generation of microwaves by a relativistic beam. The instability is driven both by partial f/partial (p perpendicular) 7 0 and the relativistic dependence on cyclotron frequency on particle energy. This dependence can cause a bunching in azimuthal angle in such a way as to cause net particle energy to decrease. The nonlinear evolution of this system is studied by writing the orbit equations for a small number of particles averaged over the fast time scale. The orbit equations are then integrated numerically. The equation for the mode amplitude is found by converging energy between waves and particles. A simple analytic theory is also presented which successfully predicts the maximum field amplitude and also the behavior of the system for times long after saturation. Author (GRA)

N74-30185# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MAGNETOHYDRODYNAMIC GENERATORS
E. I. Yantovskii and I. M. Tolmach 9 Apr. 1974 763 p refs Transl. into ENGLISH from the monograph "Magnitogridrodinamicheskiye Generatory" 1972 p 1-425
(AD-779787; FTD-MT-24-238-74) Avail: NTIS CSCL 10/2

The monograph discusses problems of the theory, calculation and design of magnetohydrodynamic generators, and also some experimental studies relating to them. GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-30186 California Univ., Davis.
STIMULATED BRILLOUIN AND BACKWARD RAMAN LIGHT SCATTERING Ph.D. Thesis
David Huntington Bonnett 1973 56 p
Avail: Univ. Microfilms Order No. 74-16243

Exact solutions are presented of the partial differential equations used to describe simulated Brillouin and backward Raman light scattering. A distributed noise source was added to the vibration equation to stimulate thermal acoustic waves or zero point vibrations molecules. Statistical fluctuations in the transient scattering caused by random noise sources are computed. All solutions were obtained by digital computer and numerical methods. Dissert. Abstr.

N74-30187 Pennsylvania Univ., Philadelphia.
ELECTRIC FIELD MODULATED RAMAN SCATTERING IN SEMICONDUCTORS Ph.D. Thesis
Michael Lee Shand 1973 186 p ref
Avail: Univ. Microfilms Order No. 74-14139

The electric field dependence of Raman scattering in cadmium sulfide (CdS) near resonance was investigated in order to determine the mechanisms involved in the scattering process. Pulsed electric fields were applied to relatively pure CdS platelets with the field parallel to the x or z crystallographic direction. Scattered light was analyzed with a double monochromator and the signal was measured with a boxcar integrator gated to coincide with the field pulse. At low temperature (10 K), only LO phonon field modulated Raman scattering was observed only with diagonal polarization and with incident photon energy near the exciton absorption bands. The field modulated scattering was attributed to the Frohlich interaction with intermediate exciton states. Dissert. Abstr.

N74-30188 University of Southern Calif., Los Angeles.
AVALANCHE EFFECT IN SEMICONDUCTORS Ph.D. Thesis
Yuji Okuto 1974 146 p
Avail: Univ. Microfilms Order No. 74-14468

In the light of limitations imposed by energy conservation, the previously existing understanding of the avalanche effect in semiconductors was critically examined. As a result, a simple expression to estimate the average distance for ionization scattering in semiconductors as a function of the electric field strength and the lattice temperature was obtained. This expression satisfies previously existing theoretical predictions over ranges of electric field regions where they are considered to be applicable. By recognizing the existence of a threshold energy for ionization scattering, the relationship between conventional estimates of ionization coefficients and experimentally obtainable ionization coefficients was clarified. Dissert. Abstr.

N74-30189 American Univ., Washington, D.C.
MAGNETIC ANISOTROPY AND HYPERFINE FIELDS IN AMORPHOUS AND CRYSTALLINE RARE-EARTH-FE2 INTERMETALLIC MATERIALS Ph.D. Thesis
Debabrata Sarkar 1973 79 p
(Contract N00014-68-A-0245-0002)
Avail: Univ. Microfilms Order No. 74-14197

Mossbauer measurements on Fe57 nucleus at room tempera-

ture were done on TbxDy1-xFe2 (O<or=X>or=1) cubic Laves phase pseudo-binary compounds. Magnetic anisotropy constants K sub 1 and K sub 2 were calculated by using single ion theory. By the point charge model of crystal feld theory it was shown that at 0 K, K sub 1 is about 25 times larger than K sub 2 for ErFe2. Mossbauer measurements were also performed on sputtered TbFe2, HoFe2, and ErFe2. Neutron diffraction data indicate that sputtered TbFe2 is structurally and magnetically amorphous. At room temperature, sputtered TbFe2 exhibits a Mossbauer pattern which is interpreted as due to a broad distribution of hyperfine fields. A similar distribution of hyperfine fields is observed in DyFe2 and HoFe2 at 77K. DyFe2, HoFe2, and ErFe2 show a resolved doublet at room temperature due to well defined quadrupolar interaction at the iron nuclei.
Dissert. Abstr.

N74-30190 Rochester Univ., N.Y.
THE OPTICAL PROPERTIES OF COEVAPORATED THIN FILMS Ph.D. Thesis
Douglas Henry Harrison 1974 201 p
Avail: Univ. Microfilms Order No. 74-14396

Optical properties of thin film metal-dielectric mixtures formed by simultaneous deposition from separate sources in vacuum are investigated. The Al-MgF2 mixtures are characterized by an optical transmittance minimum in the ultraviolet region of the spectrum, which is attributed to a shift in the optical plasma resonance of Al. No such minimum is observed for the mixtures Al-ThF4, Al-NdF3, and Rh-MgF2. The optical properties of thin films of Ag and Cr evaporated in vacuum and the optical properties of thin film mixtures of Ag and Cr formed by simultaneous deposition from separate sources in vacuum are studied. The optical constants of Cr and Ag-Cr mixtures are determined by the pseudo-Brewster angle method. Film characteristics of Ag, Cr, and Ag-Cr mixtures are studied by electron transmission microscopy, X-ray diffraction, and electron diffraction.
Dissert. Abstr.

N74-30191 Michigan Univ., Ann Arbor.
MOESSBAUER SPECTROSCOPY STUDY OF AGING AND FAST NEUTRON IRRADIATION EFFECTS IN A COPPER RICH Cu-Fe ALLOY Ph.D. Thesis
Thomas Hugh Gould, Jr. 1973 228 p
Avail: Univ. Microfilms Order No. 74-15734

Mossbauer spectroscopy was used to study the effects of both thermal and radiation environments on precipitation processes in the alloy Cu-0.6at%Fe. Interpretations were made of the room temperature spectra produced by iron in a variety of configurations or phases in alloy samples which were solution treated, aged at temperatures in the range 285 to 600 C, and cold rolled. In the second section, knowledge gained from thermal studies is applied to interpret the effects of fast neutrons on a variety of heat treated alloy samples. Mossbauer spectra of samples aged at low temperatures are consistent with the growth of spherical clusters or Guinier-Preston zones. The distribution of isomer shifts and quadrupole splittings associated with local configurational variations of iron in three basic environments were treated by using Gaussian-distributed Lorentzian functions to fit the complex spectra.
Dissert. Abstr.

N74-30192 Illinois Univ., Urbana.
HYPERFINE INTERACTIONS IN FERRITES AND ORTHOFERRITES AT HIGH PRESSURE Ph.D. Thesis
Nicholas Allen Halasa 1974 101 p
Avail: Univ. Microfilms Order No. 74-14546

Mossbauer spectroscopy was used to investigate the high pressure dependence of nuclear hyperfine interactions in magnetic insulators up to 140 kilobars. Four orthoferrites, nickel ferrite, and magnetite were considered. The hyperfine magnetic field increased with pressure for all four orthoferrites. Weiss molecular field theory was used to calculate the Neel temperature as a function of pressure, based on the assumption that H sub o, the atmospheric magnetic field at zero degrees Kelvin, is a constant. Three of the conpounds give a straight line for the Neel temperature as a function of pressure, while LaFeO3 gives a nonlinear result.
Dissert. Abstr.

N74-30193 California Univ., Riverside.
SPECIFIC HEAT SUPERCONDUCTORS NEAR THE TRANSITION TEMPERATURE Ph.D. Thesis
Dennis Raymond Imbro 1973 94 p
Avail: Univ. Microfilms Order No. 74-13569

The theory of Ginzburg and Landau was reviewed and it was found that the internal energy, E, is related to the free energy functional. In zero dimensional samples the spatial variations were neglected and E was easily calculated exactly. In one and two dimensional systems it was necessary to adopt approximations for the correlation functions. An important approximation is the assumption that since fluctuations are important only very close to T sub C one may replace beta equals (K sub B T) to the minus first power by its value at the transition temperature, beta sub C. This approximation is made when calculating the internal energy in one and two dimensional systems.
Dissert. Abstr.

N74-30194*# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Science.
GRAIN BOUNDARY MOBILITY IN ANION DOPED MgO
Cawas M. Kapadia and Martin H. Leipold [1973] 55 p refs
(Grant NGL-18-001-042)
(NASA-CR-139218) Avail: NTIS HC $5.75 CSCL 20L

Certain anions OH(-), F(-) and Gl(-) are shown to enhance grain growth in MgO. The magnitude of their effect decreases in the order in which the anions are listed and depends on their location (solid-solution, second phase) in the MgO lattice. As most anions exhibit relatively high vapor pressures at sintering temperatures, they retard densification and invariably promote residual porosity. The role of anions on grain growth rates was studied in relation to their effect on pore mobility and pore removal; the atomic process controlling the actual rates was determined from observed kinetics in conjunction with the microstructural features. With respect to controlling mechanisms, the effects of all anions are not the same. OH(-) and F(-) control behavior through creation of a defect structure and a grain boundary liquid phase while Cl(-) promotes matter transport within pores by evaporation-condensation. Studies on an additional anion, S to the minus 2nd power gave results which were no different from undoped MgO, possibly because of evaporative losses during hot pressing. Hence, the effect of sulphur is negligible or undetermined.
Author

N74-30195*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
CARBON THIN FILM THERMOMETRY Final Report
R. S. Collier, L. L. Sparks, and T. R. Strobridge Oct. 1973 63 p refs
(NASA Order H-92167-A)
(NBSIR-74-355; NASA-CR-120333) Avail: NTIS HC $6.25 CSCL 20L

The work concerning carbon thin film thermometry is reported. Optimum film deposition parameters were sought on an empirical basis for maximum stability of the films. One hundred films were fabricated for use at the Marshall Space Flight Center; 10 of these films were given a precise quasi-continuous calibration of temperature vs. resistance with 22 intervals between 5 and 80 K using primary platinum and germanium thermometers. Sensitivity curves were established and the remaining 90 films were given a three point calibration and fitted to the established sensitivity curves. Hydrogen gas-liquid discrimination set points are given for each film.
Author

N74-30196# Technische Hogeschool, Delft (Netherlands).
ELASTIC MODULI AND INTERNAL FRICTION OF COLD WORKED COPPER SINGLE CRYSTALS Ph.D. Thesis
David Weiner 15 May 1974 133 p refs
Avail: NTIS HC $9.75

Plastic extension of single crystals gives rise to a change of the elastic moduli E (Young's modulus) and G (shear modulus). The internal friction of the deformed crystal only changes due to the dislocations produced. In a number of orientations, the start of mechanical twinning is observed both by audible clicks and by serrations on the stress-strain curve. The remaining modulus effects, together with the internal friction, were attributed to dislocations.
J.A.M.

N74-30197# Technischen Universitaet, Hanover (West Germany).
MAGNETIC RESONANCE STUDIES ON THIN NICKEL,

TITANIUM, AND GERMANIUM-EVAPORATED LAYERS Ph.D. Thesis [MAGNETISCHE RESONANZUNTERSUCHUNGEN AN DUENNEN NICKEL-, TITAN- UND GERMANIUM-AUFDAMPFSCHICHTEN]
Siegfried Bagdonat 1973 80 p refs In GERMAN
Avail: NTIS HC $7.00

Pure and oxygen enriched titanium films did not produce ERS signals at thicknesses between 50 and 100 A; their concentration was below the proven limit of 10 to the 11th power spins/Oe sq cm. Germanium films showed a signal at g = 2.0028 at a concentration of only 10 to the 13th power spins; this signal was attributed to the radical surface properties of carbon impurity. Nickel films were only responsive at 5 atomic states above the ferromagnetism in a collective spin behavior. The course of saturation magnetization confirms the spin wave theory for even the thinnest layers; the effect of surface anisotrophy is inverse proportional to layer thickness. Transl. by G.G.

N74-30198# Technischen Universitaet, Hanover (West Germany).
MEASUREMENT ON THE EFFECT OF NATURAL DEVELOPED SLIPS ON THE HEAT CONDUCTANCE ABILITY OF SINGLE GERMANIUM AND SILICON CRYSTALS AT LOW TEMPERATURES Ph.D. Thesis [MESSUNG DES EINFLUSSES VON NATUERLICH GEWACHSENEN VERSETZUNGEN AUF DIE WAERMELEITFAEHIGKEIT VON EINKRISTALLINEM BEI TIEFEN TEMPERATUREN]
Bernhard Schwierzi 1973 72 p refs In GERMAN
Avail: NTIS HC $6.75

Germanium and silicon lattice heat conductivities for the region 3 to 100 K are studied for the effects of natural developed slip lines caused by thermal tension during crystal growths. Statistical evaluation tests show that slip deformations shift heat conductance maxima to higher temperatures. Heat resistance in high slip single crystal germanium is larger for heat flux vertical to the growth direction than for heat flux parallel to growth direction. Transl. by G.G.

N74-30199# Bochum Univ. (West Germany).
TRANSFER BEHAVIOR OF SUPERCONDUCTING COILS WITH HIGH CURRENT DENSITY AND ELECTRONIC PROTECTIVE CIRCUITRY Ph.D. Thesis [UEBERGANGSVERHALTEN VON SUPRALEITUNGSSPULEN MIT HOHER STROMDICHTE UND ELEKTRONISCHEN SCHUTZSCHALTUNGEN]
Dietrich Joachim Hagedorn 1973 177 p refs In GERMAN
Avail: NTIS HC $12.00

Electrical and thermal properties inside superconducting coils are considered in developing an electronic control system to prevent sudden transformations from superconductivity to normal states. An analog model for the transfer behavior of partly stabilized wire coils is used to form an electronic detection and control system that monitors the effects of constant and nonlinear protective resistance on energy deprivation at high voltage currents. Transl. by G.G.

N74-30200# Technische Hogeschool, Delft (Netherlands).
THE ELECTRONIC BAND STRUCTURE OF VANADIUM OXIDE (VO) Ph.D. Thesis
Dirk Jan Kraan 27 Feb. 1974 94 p refs
Avail: NTIS HC $7.75

A presentation was made of the results of calculations on the band structure of VO as a function of the lattice parameter. Data also cover semiconductor to metal transition properties, magnetic susceptibility transition point, and specific heat curves. Author

N74-30201# Eidgenossische Technische Hochschule, Zurich (Switzerland).
ON THE CONTROLLED FRACTIONAL SOLIDIFICATION FROM THE CONDENSING FILM Ph.D. Thesis [UEBER DIE GERICHTETE FRAKTIONIERTE KRISTALLISATION AUS DEM RIESELFILM]
Max Ulrich Mayer 1973 125 p refs In GERMAN
Avail: NTIS HC $9.25

A model is formulated for the separation of fluid mixtures through fractional crystallization caused by cooling of vertical pipe surfaces. Phase transformations at different temperatures separate the fluid components according to their thermodynamic properties. Experimental studies on an organic eutectic system of naphtaline diphenyl confirm the qualitative and quantitative aspects of the model for the critical crystallization length and establish the dependence of phase distribution coefficients on process parameters (form of fluid flow, temperature and composition of liquid phase, crystal growth velocity). Transl. by G.G.

N74-30202# Toulouse Univ. (France).
PHYSICAL PROPERTIES OF Si-SiO2 INTERFACES ON THE ACTION OF ELECTRIC CONSTRAINTS Ph.D. Thesis [PROPRIETES PHYSIQUES DES INTERFACES Si-SiO2 SOUS L'ACTION DE CONTRAINTES ELECTRIQUES]
Jean Simonne 2 Jul. 1973 279 p refs In FRENCH
Avail: NTIS HC $17.00

An analysis was made of the carrier generation capacity of MOS transistors at thermodynamic equilibrium. Data are given on the physical origin of carrier generation and its effects on the properties of the Si-SiO2 interface. Several models were considered and determinations were made of service life and effects of carrier generation by avalanches on the interface. Characteristics of components used in circuit construction are given. Transl. by E.H.W.

N74-30203# Technische Hogeschool, Eindhoven (Netherlands).
INVESTIGATIONS ON THE PREPARATION, PHOTOCONDUCTIVITY AND PHOTOLUMINESCENCE OF DOPED GALLIUM SULPHIDE SINGLE CRYSTALS Ph.D. Thesis
Gerard Anton VanDerLeeden 26 Jun. 1973 75 p refs
Avail: NTIS HC $6.75

The results of photoconductivity-, photoluminescence and photo Hall-effect measurements on doped gallium sulfide single crystals are described. The measured dependence of the photoconductivity on temperature and light intensity is explained in terms of the Klasens-Duboc model. At temperatures between 100 and 300 K the photoconductance of most crystals is determined by a hole trap lying 0.23 eV above the valence band. Copper is shown to give rise to a recombination center resulting in a red photoluminescence band at 2.00 eV. From thermally stimulated current- and thermally stimulated luminescence-measurements it is concluded that cadmium gives rise to a trapping level lying 0.43 + or - 0.02 eV from one of the bands. Author

N74-30204# Technische Hochschule, Aachen (West Germany).
ORDERING STANDARDS FOR CUBIC FACE CENTERED MIXED CRYSTALS IN DIFFERENT MODELS Ph.D. Thesis [ORDNUNGSEINSTELLUNGEN KUBISCH FLAECHENZENTRIERTER MISCHKRISTALLE IN VERSCHIEDENEN MODELLEN]
Ulrich Gahn 23 Jun. 1973 83 p refs In GERMAN
Avail: NTIS HC $7.25

The Bragg-Williams-Gorsky model is modified and used to calculate equilibrium atomic configurations, free energy, transfer temperatures, phase transformations, etc., for the binary cubic faced centered mixed crystal. Exchange reactions of second to next neighbors for T much greater than 0 are included in the calculation. Also considered is a generalized quasi-chemical model that includes magnetic exchange reactions, deformation energies or third alloying components. Transl. by G.G.

N74-30205# Technischen Universitaet, Munich (West Germany).
NOISE BEHAVIOR OF SEMICONDUCTORS WITH INTERNAL SHOCK IONIZATION MULTIPLICATION DURING SPECTROSCOPY ON LOW ENERGY GAMMA OR X-RAY QUANTA Ph.D. Thesis [RAUSCHVERHALTEN VON HALBLEITERDETEKTOREN MIT INNERER VERSTAERKUNG DURCH STOSSIONISATION BEI DER SPEKTROSKOPIE VON NIEDERENERGETISCHEN GAMMA ODER ROENTGENQUANTEN]
Gerhard Berg 1973 117 p refs In GERMAN
Avail: NTIS HC $9.00

The effectiveness of multiplicating semidetectors for spectroscopic measurements on gamma rays, X-rays or weak light signals depends on an increase in free charge carriers through shock ionization effects. Only the n(+) p pion p(+) structure provides the necessary constant collection efficiency and multiplication factor over a large detection area. Preamplification noise in the

multiplicating detector amplifier systems is negligible since multiplication enhances the signal; however, inverse current noise in low energy quantum spectroscopy limits low energy responsiveness. Transl. by G.G.

N74-30206*# Monsanto Research Corp., St. Louis, Mo.
INVESTIGATION OF THE GROWTH OF GARNET FILMS BY LIQUID PHASE EPITAXY Final Report
Jerry W. Moody, Rodger W. Shaw, and Robert M. Sandfort Washington NASA Jun. 1974 64 p refs
(Contract NAS1-11794)
(NASA-CR-2413) Avail: NTIS HC $3.75 CSCL 20L

Liquid phase expitaxy was investigated to determine its applicability to fabricating magnetic rare earth garnet films for spacecraft data recording systems. Two mixed garnet systems were investigated in detail: (1) Gd-Y and (2) Eu-Yb-Y. All films were deposited on Gd3Ga5012 substrates. The uniaxial anisotropy of the Gd-Y garnets is primarily stress-induced. These garnets are characterized by high-domain wall mobility, low coercivity and modest anisotropy. Characteristic length was found to be relatively sensitive to temperature. The Eu-Yb-Y garnets exhibit acceptable mobilities, good temperature stability and reasonable quality factors. The uniaxial anisotropy of these garnets is primarily growth-induced. The system is well suited for compositional 'tailoring' to optimize specific desirable properties. Liquid phase epitaxy can be used to deposit Gd3Ga5012 spacing layers on magnetic garnet films and this arrangement possesses certain advantages over more conventional magnetic filmspacing layer combinations. However, it cannot be used if the magnetic film is to be ion implanted. Author

N74-30207# Electrotechnical Lab., Tokyo (Japan).
THEORETICAL AND EXPERIMENTAL STUDIES ON MAGNETIC INSTABILITY IN A HARD SUPERCONDUCTOR
Ken-ichi Koyama Dec. 1973 73 p refs
Avail: NTIS HC $6.75

A general stability theory for hard superconductors was developed. The theory considers: (1) thermal conduction by which temperature is reduced to prevent flux from penetrating into the superconductors, and (2) magnetic diffusion which makes up for critical current decreases or pinning force by reducing current density needed to maintain the magnetic field gradient in the superconductor. A stability requirement was obtained that can be applied to the superconductor or the composite conductor with arbitary thermal and magnetic diffusivities. Author

N74-30208# Technischen Universitaet, Munich (West Germany).
EFFECTS OF THE ABSORPTION LOCATION OF GAMMA QUANTA ON THE ENERGY DISSIPATION IN DIFFUSED SEMICONDUCTOR DETECTORS WITH INTERNAL REINFORCEMENT Ph.D. Thesis [EINFLUSS DES ABSORPTIONSORTES VON GAMMA-QUANTEN AUF DIE ENERGIEAUFLOESUNG DIFFUNDIERTER HALBLEITERDETEKTOREN MIT INNERER VERSTAERKUNG]
Anton Heuberger 29 May 1973 126 p refs In GERMAN
Avail: NTIS HC $9.50

Structural composition and geometry of avalanche detectors are evaluated for signal to noise ratios caused by the different ionization coefficients of distributed electrons and holes. Considered are the following structures for possible gamma detection (1) Gallium diffused p(+)n diodes; (2) p-diffused n(+)p structures; (3) planar n(+) pion p(+) punch through diodes; and (4) n(+)p pion p(+) read structures. Best signal to noise properties are found in the multiplication zone of the read structures for a width of about 100 microns. However, its practical application in gamma spectroscopy is doubtful considering the additional noise contributions caused by inverse current and inhomogeneous multiplications on detector surface. Transl. by G.G.

N74-30209 Indian Inst. of Tech., New Delhi. Dept. of Physics.
ELECTRONIC ABSORPTION AND INTERNAL AND EXTERNAL VIBRATIONAL DATA OF ATOMIC AND MOLECULAR IONS DOPED IN ALKALI HALIDE CRYSTALS Final Report
S. C. Jain, A. V. R. Warrier, and S. K. Agarwal Washington NBS Jul. 1974 59 p refs
(NSRDS-NBS-52; LC-74-600010) Copyright. Avail: SOD HC $0.95 as C13.48:52

Spectral data for more than 70 atomic and molecular ions doped in alkali halide crystals are tabulated. The tables include electronic absorption data, listings of internal vibrational frequencies of doped complex ions, and tabulations of the frequencies of external modes. The data that appear in the tables were selected on the basis of the consistency among different authors, the types of instruments, and the temperature of measurement. In addition to the data, the tables include the spectroscopic assignments given by the authors in the references cited. Author

N74-30210*# Tyco Labs., Inc., Waltham, Mass.
THICK FILM SILICON GROWTH TECHNIQUES Quarterly Progress Report, 1 Dec. 1973 28 Feb. 1974
H. E. Bates, D. N. Jewett, A. I. Mlavsky, and V. E. White 28 Feb. 1974 27 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953365)
(NASA-CR-139301; QPR-8) Avail: NTIS HC $4.50 CSCL 20L

One inch wide silicon ribbons up to 14 inches long have been produced from graphite dies. Several different techniques have been employed to improve the semiconductor purity of silicon. This has resulted in a general increase in quality although the techniques involved have not been optimized. The power factor of uncoated ribbon solar cells produced for material evaluation has increased to approximately 75% of those evaluation cells made from commercial silicon. The present limitation is believed due to low lifetime. Additional work has continued with new die materials; however, only composite dies of SiO2 and C show significant potential at this time. Author

N74-30211*# University of Southern Calif., Los Angeles. Chemical Engineering Dept.
ANALYTICS OF CRYSTAL GROWTH IN SPACE Annual Report, 5 Jun. 1973 - 4 Jun. 1974
William R. Wilcox, Chong E. Chang, Paul J. Shlichta, Pei-Shiun Chen, and Chong K. Kim 4 Jun. 1974 152 p refs
(Contract NAS8-29847)
(NASA-CR-120314) Avail: NTIS HC $10.75 CSCL 20B

Two crystal growth processes considered for spacelab experiments were studied to anticipate and understand phenomena not ordinarily encountered on earth. Computer calculations were performed on transport processes in floating zone melting and on growth of a crystal from solution in a spacecraft environment. Experiments intended to simulate solution growth at micro accelerations were performed. Author

N74-30212# California Univ., Berkeley. Lawrence Berkeley Lab.
SOME CALORIMETRIC INVESTIGATIONS OF THE ROLE OF f ELECTRONS IN SUPERCONDUCTIVITY AND MAGNETISM Ph.D. Thesis
S. D. Bader Jan. 1974 121 p refs
(Contract W-7405-eng-48)
(LBL-2297) Avail: NTIS HC $8.25

The heat capacity of the system (La,Ce)A12 for 0.0, 0.193, 0.64, and 0.906 at % Ce has been measured between approximately 0.06 and 22 K and in magnetic fields up to 38 kOe. In the normal state, there is R1n2 entropy associated with the Ce spin system and this entropy is removed in the formation of the spin-compensated state. The normal state Kondo temperature is 0.42 K. The three more-dilute samples exhibit superconductivity but cannot be described by the Bardeen-Cooper-Schrieffer or Abrikosov-Gor'kov theories. Significant low-energy excitations are evident in the superconducting state and they may be associated with quasibound state deep in the energy gap of the pure superconductor. For the 0.193 at. % Ce alloy in the superconducting state the characteristic temperature associated with Ce-spin ordering in the normal state is reduced by an estimated order of magnitude. For the 0.64 at.% Ce alloy a small, broadened superconducting anomaly appears in the heat capacity above 1 K. Author (NSA)

N74-30213# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
SEMICONDUCTOR X-RAY SPECTROMETER SYSTEM TYPE 454
A. McG. Beech and J. E. Eberhardt Nov. 1973 39 p refs

(AAEC/E-297) Avail: AEC Depository Libraries HC $3.75

The Type 454 semiconductor detector X-ray spectrometer provides resolution of 220 eV FWHM for the Fe K alpha X-ray line at count rates up to 10,000 pulses per second, and is suitable for the energy range 4 to 60 keV. The preamplifier uses the pulsed optical feedback technique and a remounted input field effect transistor which operates at 130 K. The detectors are fabricated from commercially available hyper-pure n-type silicon and do not suffer from the carrier trapping effects exhibited by some lithium drift compensated silicon detectors at temperatures approaching 77 K. The high initial cost of this material is offset by savings in manufacturing time and in the cost of the sophisticated equipment required for lithium drift compensation of p-type silicon. Author (NSA)

N74-30214# Pittsburgh Univ., Pa. Dept. of Chemistry.

CRYSTAL FIELD INTERACTIONS AND MAGNETIC ANISOTROPY IN LANTHANIDE INTERMETALLICS Final Report, 4 Jan. 1965 - 3 Jan. 1974

William E. Wallace and Raymond S. Craig 15 Apr. 1974 17 p refs

(Grants DA-ARO(D)-31-124-71-G74; DA-ARO(D)-31-124-G-636; DA-ARO(D)-31-124-G-974)

(AD-779530; AROD-5375-23-MC) Avail: NTIS CSCL 20/12

The rare earth-cobalt permanent magnets owe their utility to a favorable combination of properties - high Curie temperatures, large saturation magnetizations and strong magnetic anisotropies. The anisotropy is a crystal field effect. The strength of the crystal field effect can be obtained by a suitable combination of of theoretical and experimental work. The major experimental approach used in the present work is the study of low temperature heat capacities which leads to an evaluation of the crystal field interaction. The effect of alloying on the anisotropy of R2Co17 compounds is presented for a number of systems. The theoretical work carried out, making use of the operator equivalent method, enables one to predict the sign of the anisotropy for RCo5 compounds. Author (GRA)

N74-30215# Illinois Univ., Urbana. Coordinated Science Lab.

PHOTOLUMINESCENCE FROM IRRADIATION-INDUCED DEFECTS IN SILICON

John Robert Noonan Apr. 1974 181 p refs

(Contract DAAB07-72-C-0259; Grants NSF GK-29714; NSF GH-40450)

(AD-779314; R-645; UILU-ENG-74-2209) Avail: NTIS CSCL 20/12

New information concerning the identification of radiative defects in Si is provided by three sets of experiments which study the photoluminescence from Si irradiated with electrons at low temperature (100K), Si subjected to ion implantations, and electron irradiations of Al and Ga doped Si. (Modified author abstract) GRA

N74-30216# IBM Watson Research Center, Yorktown Heights, N.Y.

STRUCTURE OF INTERFACES IN SOLIDS, AND THE INFLUENCE OF THIS STRUCTURE ON ADHESION AND FRICTION AND WEAR Final Report

P. Chaudhari and J. W. Matthews Feb. 1974 28 p refs

(Contract F44620-72-C-0061; AF Proj. 9761)

(AD-778473; AFOSR-74-0680TR) Avail: NTIS CSCL 20/2

The work investigated the structure of grain boundaries and interfaces using a smoke technique developed earlier by us. It also investigated the formation of misfit dislocations and showed that under certain conditions the formation of screw dislocations is favored over edge dislocations. A detailed investigation of the formation of interface dislocations in garnets was carried out. The garnets are good magnetic bubble materials. The process of wear and friction was investigated in thin films. The deformation process was characterized using electron microscopy and a variety of new results in this old field were obtained. A combination of interface sliding and accommodating relaxation mechanisms was involved to explain the phenomena of superplasticity. Magnetic bubbles were used to stimulate atomic arrangement in two dimensional lattices and the structure of grain boundaries and amorphous material was investigated with this technique. This technique also provided a unique method of measuring domain wall velocities. Author (GRA)

N74-30217# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.

RENORMALIZATION-GROUP VERIFICATION OF CROSS-OVER WITH RESPECT TO THE LATTICE ANISOTROPY PARAMETER

T. S. Chang and H. Eugene Stanley 30 May 1973 4 p Revised

(Grant AF-AFOSR-2197-72; AF Proj. 9767)

(AD-778269; AFOSR-74-0545TR) Avail: NTIS CSCL 20/12

A numerical analysis of a cross over in systems with lattice anisotropy is presented. The manner in which the weakly interacting dimensions manifest themselves as the renormalization transformations occur in strongly interacting dimensions is observed. It is demonstrated that there is a scaling with respect to the anisotropy parameter R. It is proven that phi equals gamma for all lattice dimensions including noninteger dimensions. A system of d-dimensional hyperplanes of ferromagnetically interacting Ising spins is analyzed. Author

N74-30218# IBM Watson Research Center, Yorktown Heights, N.Y.

MOBILITY OF MAGNETIC CYLINDER DOMAINS Final Report

Feb. 1974 7 p refs

(Contract F44620-72-C-0060)

(AD-778419; AFOSR-74-0682TR) Avail: NTIS CSCL 20/12

The objective of the project was to determine the physical mechanism of motion of cylinder (bubble) domains in magnetic films. Since the motion is influenced by crystalline defects, study of the latter was a related objective. GRA

N74-30219# Battelle Columbus Labs., Ohio.

RARE EARTH COBALT SINGLE CRYSTALS Final Report, 1 Jan. - 31 Dec. 1973

Alfred E. Austin and James F. Miller Feb. 1974 35 p refs

(Contract F33615-73-C-5038)

(AD-779719; AFML-TR-74-28) Avail: NTIS CSCL 20/2

Single crystals of Sm(1-x)Pr(x)Co5 and Y(1-x)Nd(x)Co5 were grown for x = 0.25, 0.50, and 0.75. Crystals of Gd(0.33)Nd(0.67)Co5 and Gd(0.5)Nd(0.5)Co5 and Sm2Fe4.24Co12.75 were also grown. The conditions for crystal growth are summarized. Data are reported on magnetic domains, unit cell lattice constants, compositions and of inclusion phases for these systems. Author (GRA)

N74-30220# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

CONTINUOUS SILICON SOLAR CELLS Semiannual Progress Report, 1 Apr. - 30 Sep. 1973

B. Chalmers, T. Surek, A. I. Mlavsky, R. O. Bell, and D. N. Jewett Sep. 1973 91 p refs Prepared in cooperation with Tyco Labs., Inc., Waltham, Mass.

(Grant NSF GI-37067)

(PB-228875/1; NSF-RA/N-73-058; NSF-RANN/SE/GI-37067/PR-73-2) Avail: NTIS HC $7.50 CSCL 20B

The report describes theoretical and experimental investigations of the application of the edge-defined film-fed growth (EFG) crystal growth technique to the continuous growth of single crystal silicon ribbons from the melt. A detailed analysis of the fluid flow processes which occur during EFG ribbons growth, and some preliminary calculations of the heat flow are presented. The effects of these calculations on the design and development of the crystal growth equipment are described. Author (GRA)

N74-30221# Delaware Univ., Newark. Inst. of Energy Conversion.

A NEW X-RAY DIFFRACTION-FLUORESCENCE METHOD FOR THE STUDY OF THIN FILMS: PRELIMINARY RESULTS FOR CuxS CdS Direct Solar Energy Conversion for Large Scale Terrestrial Use

J. M. Schultz 15 Jun. 1973 15 p refs

(Grant NSF GI-34872)

(PB-228019/6; NSF-RA/N-73-023; NSF-RANN/SE/GI-34872/TR-73-6) Avail: NTIS HC $3.00 CSCL 20B

The structure of an ion-exchanged layer of CuxS on CdS was studied by a novel X-ray diffraction-fluorescence method.

The method used solid-state Ge crystal detector and a low incident angle for the X-ray beam. The diffraction results show no agreement with known CuxS structures. A reversible phase transition is induced as the temperature of the CuxS/CdS bilayer is increased. The material is of use in solar cell research. (Modified author abstract) GRA

N74-30222# Dayton Univ. Research Inst., Ohio.
INELASTIC ELECTRON SPECTROSCOPY STUDY Final Report, 2 Apr. - 31 Dec. 1973
Thomas P. Graham and Robert G. Keil Feb. 1974 51 p refs
(Contract F33615-73-C-5149; AF Proj. 1457)
(AD-779672; UDRI-TR-73-52; AFML-TR-74-32) Avail: NTIS CSCL 20/12

Activities regarding the design, construction and testing of equipment necessary for sample preparation and the inelastic electron tunneling spectrometer are described in detail. To successfully prepare a tunnel junction the supplied vacuum had to be made functional and then modified so that the following functions could be performed: (1) metal evaporation, (2) metal oxidation by glow discharge and (3) oxide contamination through bleed-in devices. Many of the difficulties encountered and the procedures used to eliminate them are discussed. Experimental tunnel junction spectral data are included and discussed in view of existing literature. Author (GRA)

N74-30223# Army Foreign Science and Technology Center, Charlottesville, Va.
THERMOELECTRIC PROPERTIES OF INDIUM SELENIDE: BISMUTH SELENIDE SYSTEM ALLOYS
G. Gukhman, M. G. Kostova, and S. M. Nicklova 5 Apr. 1974 7 p refs Transl. into ENGLISH from Khim. i Industr. (Bulgaria), no. 7, 1969 p 1067-1070
(AD-779612; FSTC-HT-23-1654-72) Avail: NTIS CSCL 20/12

The coefficient of thermoelectromotive force, the condition, and the thermal condition were determined for In2Se3-Bi2Se3 alloys as function of the compound and temperature of the thermal treatment. The results confirm the presence of one phase solid solutions over a wide range of Bi2Se3 compounds (10-90 mole percent). The alloys are semiconductors in the nondegenerative state. The high values of the coefficient of the thermoelectromotive force and the low values of the thermal condition coefficient suggests they can be used in thermoelectric measuring devices. GRA

N74-30224# Wayne State Univ., Detroit, Mich. Dept. of Physics.
AN INVESTIGATION OF MAGNETIC SEMICONDUCTING GLASSES AND DILUTE MAGNETIC ALLOYS Final Report
Vincent Cannella Apr. 1974 12 p refs
(Grant AF-AFOSR-2002-71; AF Proj. 9761)
(AD-779744; AFOSR-74-0778TR) Avail: NTIS CSCL 20/12

The properties of amorphous and disordered magnetic systems were investigated in transition metal oxide-aluminosilicate glasses and in noble metal-transition metal spin glass alloys. Sharp peaks in the temperature dependence of the low field magnetic susceptibilities were found at low temperatures which do not seem to be associated with magnetic phase transitions. These sharp peaks may be due to an anisotropy mechanism in the alumino-silicate glasses. The origin of this behavior is not understood in the dilute alloys which show striking systematic similarities despite differences in alloy components and local magnetic clustering effects. Author (GRA)

N74-30225# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
OPTICAL PROPERTIES OF METALS
Joseph Callaway Mar. 1974 9 p refs
(Grant AF-AFOSR-2020-71; AF Proj. 9763)
(AD-779046; AFOSR-74-0757TR) Avail: NTIS CSCL 20/12

The work has demonstrated that band theory is capable of giving a reasonably accurate account of the optical conductivity of both simple and transition metals in an energy region from the onset of direct interband transition up to excitations of the order of 5-10 eV. Lifetime broadening effects become appreciable as the excitation energy increases, but the basic structure of the optical conductivity is determined by the one electron theory. Even in the ferromagnetic transition elements, there is no evidence from any of the properties studied here that electrons are localized, or that many body effects are unusually large. The degree of agreement between band theory and experiment is about as large for ferromagnetic metals as it is for simple metals. Author (GRA)

N74-30226# Illinois Univ., Urbana. Dept. of Physics.
THEORETICAL PROBLEMS IN SOLID STATE AND LOW TEMPERATURE PHYSICS Final Report, 1 Sep. 1968 - 31 Aug. 1973
John Bardeen and David Pines 14 Apr. 1974 11 p refs
(Contract DAHC04-69-C-0007; AROD Proj. 7948-P)
(AD-779451; AROD-7941-31-P) Avail: NTIS CSCL 20/12

The major fields in which work was done are (1) superconductivity, (2) properties of liquid helium and He3 -He4 mixtures, (3) electronic structure of solids, (4) plasmas and turbulence in liquids (5) phenomena in the vicinity of magnetic phase transitions, and (6) surface and interface effects. A common theme is application and development of techniques of many-body theory, that is systems of many interacting particles. GRA

N74-30227# Naval Research Lab., Washington, D.C.
PROPERTIES OF RF SPUTTERED ZINC OXIDE THIN FILMS FOR MICROWAVE ACOUSTIC DEVICES Interim Report
T. R. Larson and M. Finnley 1 May 1974 24 p refs
(NRL Proj. R08-54; RR0210541)
(AD-779260; NRL-7737) Avail: NTIS CSCL 09/1

Various factors involved in the production of piezoelectric zinc oxide thin films and their utilization as acoustic transducers were studied, along with techniques for analysis and fabrication of actual devices. The best transducers in this study exhibited coupling constants approximately 60% as large as the theoretical value and a minimum untuned insertion loss of 30 db. Bulk transducer technology was emphasized, since analysis of the zinc oxide film is relatively easy in this configuration; however, most of the concepts are directly applicable to surface wave transducers, the ultimate motivation for this work. Author (GRA)

N74-30228# City Coll. Research Foundation, New York.
OPTICAL PROPERTIES OF SEMICONDUCTORS AND METALS Final Scientific Report, 1 Jan. 1969 31 May 1974
Narkis Tzoar and Joel I. Gersten 31 May 1974 23 p refs
(Grant AF-AFOSR-1978-71; AF Proj. 9763)
(AD-779745; AFOSR-74-0777TR) Avail: NTIS CSCL 20/12

The programs of investigation were designed to enhance the understanding of the interaction of electromagnetic radiation with solids. In particular the electronic structure and the linear and nonlinear optical properties of semiconductors and metallic surfaces were studied. The former materials are used in modern solid state electronic circuitry for detection, amplification, and communication in aerospace environments. Research relating to metallic surfaces centered upon the photoemission phenomenon-a problem important for understanding the response of electronic components to high frequency radiation and also important for the design of high efficiency photoemitters. The study involved calculating the high frequency dielectric properties of semiconductors including electronic and ionic fluctuations, anisotropy effects, magnetic fields, impurities, and band structure using appropriate generalizations of the many body perturbation method. (Modified author abstract) GRA

N74-30229# Hawaii Inst. of Geophysics, Honolulu.
A STUDY OF Na2O-TiO2-SiO2- GLASSES Technical Report, 1 Jan. - 31 Dec. 73
Murli H. Manghnani Jan. 1974 20 p refs
(Contract N00014-67-A-0387-0012; NR Proj. 032-527)
(AD-779487; TR-4) Avail: NTIS CSCL 20/12

The infrared absorption spectra of six Na2O-TiO2-SiO2 glasses in the frequency range of 1600-200/cm are reported. These glasses, having a SiO2/Na2O molar ratio of 1.67-3.54, and containing 20 or 25 mole percent TiO2, demonstrate two main absorptions at 950/cm and at 450/cm. The infrared results may be interpreted in terms of a lowering of symmetry occurring for the SiO4 units. The effect of TiO2 content on the relationship between vibrational frequency is discussed. (Modified author abstract) GRA

N74-30230# International Business Machines Corp., Yorktown Heights, N.Y.
INELASTIC LIGHT SCATTERING STUDIES OF THE OPTICAL PROPERTIES OF SOLIDS Final Report
John E. Smith, Jr. Feb. 1974 13 p refs
(Contract F44620-71-C-0039; AF Proj. 9763)
(AD-779038; AFOSR-74-0756TR) Avail: NTIS CSCL 20/12

The properties of several classes of solids have been studied using inelastic light scattering (Raman scattering) and complimentary techniques. The Raman and infrared spectra of amorphous solids were shown to be a measure of the vibrational density of states. The spectra of several structural models of amorphous Ge and Si have been numerically calculated; these calculations are in good agreement with experiments, thus giving support to a tetrahedrally coordinated random network model and elucidating the character of the coupling constants relating Raman and infrared spectra to the vibrational density of states. Lattice dynamics of transition metal dichalcogenide layered compounds have been studied using Raman and infrared spectroscopy. The experiments are interpreted in terms of the character and strength of the bonding in the compounds and systematics through the family of compounds. Resonant Raman scattering is studied in MoS2 and Cu2O. Preliminary results on the electronic Raman scattering of Sm ions in samarium chalcogenides are reported. These results give a measure of exchange interactions in these compounds. Author (GRA)

N74-30231# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF HETEROGENEOUS TYPES OF PRECESSION IN SINGLE CRYSTALS OF FERRITES FOR MANUFACTURING MULTIPLE-VALUED ELEMENTS
A. D. Lantsman and O. F. Menshikh 18 Apr. 1974 9 p refs
Transl. into ENGLISH from the book "Mnogoustoichivye Elementi Ikh Primenenie. Sbornik Statei" USSR, 1971 p 206-209
(FTD Proj. T74-05-12)
(AD-779654; FTD-HT-23-1017-74) Avail: NTIS CSCL 20/12

The multivalue nature of resonance frequencies of ferromagnetic resonance, observed during the creation of inhomogeneous variable magnetic fields inside ferrite single crystals, was analyzed. The reproducibility of these resonance frequencies is discussed. Author

N74-30232# California Univ., Los Angeles. Dept. of Physics
LOW TEMPERATURE PROPERTIES OF THE ONE DIMENSIONAL POLARON BAND: 1. EXTREME BAND NARROWING REGIME
G. Beni, P. Pincus, and J. Kanamori (Osaka Univ.) Dec. 1973 22 p refs
(Contract N00014-69-A-0200-4032)
(AD-779076) Avail: NTIS CSCL 20/12

The authors consider a narrow one dimensional tight binding chain with intra-atomic Coulomb repulsions described in the Hubbard model. The electrons at each site are furthermore assumed coupled to a high frequency local oscillator. In the limit, where the oscillator frequency is large compared to the bandwidth and in the extreme band narrowing regime, for various electron densities, the authors found that: half-filled band ground state is an antiferromagnetic insulator; one-third filled band is a diamagnetic insulator; one-quarter filled band is a weakly coupled system of bound singlet pairs somewhat reminiscent of superconductivity. (Modified author abstract) GRA

N74-29895* Rensselaer Observatory, Troy, N.Y. Dept. of Chemistry.
VAPOR GROWTH OF GeTe SINGLE CRYSTALS IN MICROGRAVITY
H. Wiedemeier, F. C. Klaessig, S. J. Wey, and E. A. Irene *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 235-256 refs (For availability see N74-29885 19-15)
CSCL 20B

N74-29896* Alabama Univ., Huntsville. Dept. of Physics.
SEEDED, CONTAINERLESS SOLIDIFICATION OF INDIUM ANTIMONIDE
H. U. Walter *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 257-273 refs (For availability see N74-29885 19-15)
(Contract NAS8-28304)
CSCL 20B

N74-29897* Massachusetts Inst. of Tech., Cambridge.
STEADY STATE GROWTH AND SEGREGATION UNDER ZERO GRAVITY: InSb
A. F. Witt, M. Lichtensteiger, M. C. Lavine, and C. J. Herman *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 275-299 refs (For availability see N74-29885 19-15)
CSCL 20B

N74-29898* University of Southern Calif., Los Angeles.
DIRECTIONAL SOLIDIFICATION OF InSbGaSb ALLOYS
James F. Yee, Sanghamitra Sen, Kalluri Samra, Mu-Ching Lin, and William R Wilcox *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 301-374 refs (For availability see N74-29885 19-15)
CSCL 20B

N74-29899* Texas Instruments, Inc., Dallas.
INFLUENCE OF GRAVITY-FREE SOLIDIFICATION ON MICROSEGREGATION
John T. Yue and Fred W. Voltmer *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 375-425 refs (For availability see N74-29885 19-15)
CSCL 20B

N74-29916* National Bureau of Standards, Washington, D.C.
MATERIALS SCIENCE AND MANUFACTURING IN SPACE: THE NBS PROGRAM OF GROUND BASED RESEARCH
E. Passaglia and R. L. Parker *In* NASA. Marshall Space Flight Center Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 763-835 refs (For availability see N74-29905 19-15)
CSCL 20B

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-30233*# Boeing Aerospace Co., Seattle, Wash. Research and Engineering Div.
ADVANCED TECHNIQUES FOR DETERMINING LONG TERM COMPATIBILITY OF MATERIALS WITH PROPELLANTS Final Report, 21 Jun. 1972 - 15 Dec. 1973
Richard L. Green, James P. Stebbins, Alan W. Smith, and Kent E. Pullen Dec. 1973 223 p refs Prepared for JPL
(Contract NAS7-789)
(NASA-CR-139364; D180-14839-2) Avail: NTIS HC $14.25 CSCL 21I

A method for the prediction of propellant-material compatibility for periods of time up to ten years is presented. Advanced sensitive measurement techniques used in the prediction method are described. These include: neutron activation analysis, radioactive tracer technique, and atomic absorption spectroscopy with a graphite tube furnace sampler. The results of laboratory tests performed to verify the prediction method are presented. E.J.O.

N74-30234# Technische Hochschule, Hanover (West Germany).
THE EFFECT OF IGNITION ACCELERATORS ON IGNITION EFFICIENCY AND KNOCK RESISTANCE OF LIGHT HYDROCARBONS IN COMBUSTION ENGINE Ph.D. Thesis [DER EINFLUSS VON ZUENDBESCHLEUNIGERN AUF ZUENDWILLIGKEIT UND KLOPFFESTIGKEIT VON LEICHTEN KOHLENWASSERSTOFFEN IM VERBRENNUNGSMOTOR]
Klaus Becker 1973 191 p refs In GERMAN
Avail: NTIS HC $12.75

Cetan numbers of various pure hydrocarbons and fuel components of differing chemical composition are rated in relation to the development of multifuel compression/ignition engines.
Transl. by G.G.

N74-30235# National Aerospace Lab., Tokyo (Japan).
COMBUSTION OF COMPOSITE PROPELLANTS IN ACCELERATION FIELD
Shinichi Ishii, Takashi Niioka, Tohru Mitani, Mamoru Takahashi, and Muneo Izumikawa 1973 14 p refs In JAPANESE; ENGLISH summary
(NAL-TR-354) Avail: NTIS HC $4.00

Tests were conducted to determine the burning rate of solid rocket propellants under accelration conditions. The effects of aluminum content, the mass median diameter, and the variance of aluminum particle size distribution are accounted for. Tests were conducted on ten kinds of composite propellants with acceleration loads up to 350 g directed normal to the combustion surface. It was determined that increasing the aluminum particle size is likely to induce a more sensitive burning rate. The acceleration sensitivity of the burning rate depends strongly on the static burning rate. Author

N74-30236# Aerospace Corp., El Segundo, Calif. Engineering Science Operations.
A SURVEY OF MONOPROPELLANT HYDRAZINE THRUSTER TECHNOLOGY
M. J. Russi 15 Apr. 1974 22 p refs
(Contract F04701-73-C-0074)
(AD-779683; TR-0074(4901-01)-3; SAMSO-TR-74-79) Avail: NTIS CSCL 21/9

Since the development of the Shell 405 catalyst for the spontaneous decomposition of hydrazine, hydrazine thrusters have been used almost exclusively for attitude control and on-orbit maneuvering of satellites and spacecraft. This report gives a brief account of the multitude of thrusters ranging from less than .1 lb of thrust to greater than 300 lb of thrust that have been developed for more than 30 applications. Major emphasis, however, is on problems that have been encountered during development or flight. These problems include catalyst bed life, thermal management, material compatibility and valve leakage. It is concluded that in spite of the apparent success and widespread acceptance of hydrazine thrusters, reactor design is still largely empirical, requiring substantial testing to establish performance and life characteristics for each new application. In addition, as longer life thrusters are developed, the problems of catalyst life and material life become more limiting. Recently initiated government sponsored programs aimed at solving these long life problems are described briefly. (Modified author abstract)
GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-30237 Texas Univ., Austin.
SEQUENTIAL ESTIMATION OF RANDOM THRUST ERRORS FOR SOLAR ELECTRIC PROPULSION SPACECRAFT Ph.D. Thesis
Thomas Julian Eller 1974 184 p
Avail: Univ. Microfilms Order No. 74-14686

The adaptability of dynamic model compensation (DMC) algorithms to the problem of compensating for the effects of dynamic model errors due to random anomalies in the solar electric propulsion system of a space vehicle is investigated. The nominal mission assumed for this study is initiated at heliocentric injection and terminates with a fly-by of the asteroid Eros at 1.45 AU, 152 days later. Simulated observations from an onboard star tracker and range rate observations from tracking stations on a rotating earth are used in an extended sequential filter to estimate the motion of the vehicle and three components of the thrust acceleration error vector. A comparison is made of the estimation accuracy obtained with a standard filter and with each of four Gauss-Markov process models used in the filter to compensate for the unmodeled random accelerations. Limiting accuracies for these models are investigated. Dissert. Abstr.

N74-30238*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
EROSION IN RADIAL INFLOW TURBINES. VOLUME 2: BALANCE OF CENTRIFUGAL AND RADIAL DRAG FORCES ON EROSIVE PARTICLES Final Report
W. B. Clevenger and W. Tabakoff Apr. 1974 37 p refs
(Grant NGR-36-004-055)
(NASA-CR-134616) Avail: NTIS HC $5.00 CSCL 21E

The particle motion in two-dimensional free and forced inward flowing vortices is considered. A particle in such a flow field experiences a balance between the aerodynamic drag forces that tend to drive erosive particles toward the axis, and centrifugal forces that prevent these particles from traveling toward the axis. Results predict that certain sizes of particles will achieve a stable orbit about the turbine axis in the inward flowing free vortex. In this condition, the radial drag force is equal to the centrifugal force. The sizes of particles that will achieve a stable orbit is shown to be related to the gas flow velocity diagram at a particular radius. A second analysis yields a description of particle sizes that will experience a centrifugal force that is greater than the radial component of the aerodynamic drag force for a more general type of particle motion. Author

N74-30239*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CONCEPTUAL DESIGN STUDIES OF LIFT/CRUISE FANS FOR MILITARY TRANSPORTS Final Report
6 Aug. 1974 264 p refs
(Contract NAS3-17850)
(NASA-CR-134636; R74AEG283) Avail: NTIS HC $16.25 CSCL 21E

A study program for conceptual design studies of remote lift and lift/cruise fan systems to meet the requirements of military V/STOL aircraft was conducted. Parametric performance and design data are presented for fans covering a range of pressure ratios, including both single and two stage fan concepts. The gas generator selected for these fan systems was the J101-GE-100 engine. Noise generation and transient response were determined for selected fan systems. Author

N74-30240*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NOISE GENERATED BY QUIET ENGINE FANS. 2: FAN A
Francis J. Montegani, John W. Schaefer, and Edward G. Stakolich Washington Jul. 1974 74 p refs
(NASA-TM-X-3066; E-7857) Avail: NTIS HC $3.75 CSCL 21E

A significant effort within the NASA Quiet Engine Program has been devoted to acoustical evaluation at the Lewis Research Center noise test facility of a family of full-scale fans. This report, documents the noise results obtained with fan A - a 1.5-pressure-ratio, 1160-ft/sec-tip-speed fan. The fan is described and some aerodynamic operating data are given. Far-field noise around the fan was measured for a variety of configurations pertaining to acoustical treatment and over a range of operating conditions. Complete results of 1/3-octave band analysis of the data are presented in tabular form. Included also are power spectra and sideline perceived noise levels. Some representative 1/3-octave band data are presented graphically, and sample graphs of continuous narrow-band spectra are also provided. Author

N74-30241# National Aerospace Lab., Tokyo (Japan).
AERODYNAMIC INVESTIGATION OF AN AIR-COOLED AXIAL-FLOW TURBINE. PART 1: TURBINE DESIGN AND OVERALL STAGE PERFORMANCE WITHOUT SUPPLY OF COOLING-AIR
Atsumasa Yamamoto, Kitao Takahara, Hiroyuki Nouse, Sigeo Inoue, Hirosi Usui, and Fujio Mimura 1973 34 p refs In JAPANESE; ENGLISH summary
(NAL-TR-321-Pt-1) Avail: NTIS HC $4.75

A single stage turbine with a 22 inch diameter was designed

to investigate air cooled turbines operating in a high temperature environment. The statir and rotor blades are characterized by low blade solidity, thick blade section, blunt leading edge and trailing edge, and low blade aspect ratio. The turbine satisfied the equivalent design value of specific work output at the design condition with an efficiency of 85.6 percent. It is concluded that the present airfoil shapes designed for an air cooled turbine are satisfactory from an aerodynamic standpoint and that changes in the airfoil shape for cooling considerations did not noticeably impair the turbine overall performance. Author

N74-30242# National Aerospace Lab., Tokyo (Japan).
OFF-DESIGN-POINT PERFORMANCES OF MULTI-SPOOL TURBO FAN ENGINES
Mitsuo Morita and Shizuo Sekine 1973 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-347) Avail: NTIS HC $4.25

A method for estimating the off design point performances of aircraft engines is presented. The method is applicable to the performance calculation of various forms of aircraft engines including single and twin spool turbojets and multi-spool turbofan engines. The steps to be followed in conducting the numerical analysis are outlined. The calculated results were compared with the flight test results of several turbofan engines with good correlation. Author

N74-30243*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTANTANEOUS DISTORTION IN A MACH 2.5, 40-PERCENT-INTERNAL-CONTRACTION INLET AND ITS EFFECT ON TURBOJET STALL MARGIN
Paul L. Burstadt and James E. Calogeras Washington Jul. 1974 42 p refs
(NASA-TM-X-3002; E-6294) Avail: NTIS HC $3.25 CSCL 21E

An experimental wind tunnel investigation was conducted to determine the effects of time-variant distortions produced in a supersonic inlet on a J85-GE-13 turbojet engine. Results are presented principally in terms of instantaneous distortion amplitudes and total-pressure contours measured through compressor stall. They indicate that, although a time-averaged distortion may be far from a stall-inducing value, corresponding instantaneous distortion amplitudes can approach or exceed this value. Seven engine stall events were studied. In six of these events instantaneous distortion peaks of sufficient magnitude to cause stall were observed in the time period shortly before stall was detected. Author

N74-30244*# Boeing Commercial Airplane Co., Seattle, Wash.
ANALYTIC MODELS OF DUCTED TURBOMACHINERY TONE NOISE SOURCES. VOLUME 1: ANALYSIS
T. L. Clark, U. W. Ganz, G. A. Graf, and J. S. Westall May 1974 158 p refs
(Contract NAS1-12257)
(NASA-CR-132443; D6-43296-1) Avail: NTIS HC $5.00 CSCL 21E

The analytic models developed for computing the periodic sound pressure of subsonic fans and compressors in an infinite, hardwall annular duct with uniform flow are described. The basic sound-generating mechanism is the scattering into sound waves of velocity disturbances appearing to the rotor or stator blades as a series of harmonic gusts. The models include component interactions and rotor alone. Author

N74-30245*# Boeing Commercial Airplane Co., Seattle, Wash.
ANALYTIC MODELS OF DUCTED TURBOMACHINERY TONE NOISE SOURCES. VOLUME 2: SUBPROGRAM DOCUMENTATION
T. L. Clark, U. W. Ganz, G. A. Graf, and J. S. Westall May 1974 289 p refs
(Contract NAS1-12257)
(NASA-CR-132444; D6-43296-2) Avail: NTIS HC $6.75 CSCL 21E

Analytical models were developed for computing the periodic sound pressures of subsonic fans in an infinite hardwall annular duct with uniform flow. The computer programs are described which are used for numerical computations of sound pressure mode amplitudes. The data are applied to the acoustic properties of turbomachinery. Author

N74-30246*# Boeing Commercial Airplane Co., Seattle, Wash.
ANALYTIC MODELS OF DUCTED TURBOMACHINERY TONE NOISE SOURCES. VOLUME 3: PROGRAM TEST CASE RESULTS
T. L. Clark, U. W. Ganz, G. A. Graf, and J. S. Westall May 1974 112 p
(Contract NAS1-12257)
(NASA-CR-132445; D6-43296-3) Avail: NTIS HC $4.50 CSCL 21E

Computer programs for analyzing the acoustic properties of turbomachinery with ducted flow were developed. The models include component interactions and rotor alone. Test case results determined from the computer programs are presented. Author

N74-30247*# Fairchild Republic Div., Farmingdale, N.Y.
DEVELOPMENT OF A SHORT PULSED SOLID PROPELLANT PLASMA THRUSTER Final Report
William J. Guman 10 Mar. 1974 64 p refs Prepared for JPL
(Contracts NAS7-100; NAS1-11812; JPL-953656)
(NASA-CR-139272; MS172R0001) Avail: NTIS HC $6.25 CSCL 21C

The experimental results are summarized that were obtained in the development of a Teflon solid propellant pulsed plasma thruster. The feasibility was established of storing and feeding solid propellant in the form of an open circular loop into an operational thruster. This technique was verified to be practical by feeding over 20 inches of Teflon into a micro-thruster over an accumulated life test of 1858 hours. High energy density capacitors were evaluated under vacuum conditions when the capacitor is coupled directly to a plasma thruster. Numerous early capacitor failures were encountered. It was concluded that essentially all of the failures encountered in a vacuum environment are due to an internal electrical breakdown that will occur inside a capacitor that is not truly hermetically sealed. A steady input power significantly in excess of 130 watts can safely be tolerated if heat conduction can be provided to a sink whose temperature is about 16 C. A vacuum life test of the capacitor bank was carried out while discharging into a milli-lb. (milli-Newton) type pulsed plasma thruster. More than 1500 hours of vacuum testing of this milli-Newton type system has been accumulated without any capacitor problems. Recommendations are made for future capacitor designs. Author

N74-30248*# Marquardt Corp., Van Nuys, Calif.
DESIGN FOR PRESSURE REGULATING COMPONENTS Final Report
H. Wichmann Mar. 1973 270 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953383)
(NASA-CR-139300; S-1259) Avail: NTIS HC $16.50 CSCL 21H

The design development for Pressure Regulating Components included a regulator component trade-off study with analog computer performance verification to arrive at a final optimized regulator configuration for the Space Storable Propulsion Module, under development for a Jupiter Orbiter mission. This application requires the pressure regulator to be capable of long-term fluorine exposure. In addition, individual but basically identical (for purposes of commonality) units are required for separate oxidizer and fuel pressurization. The need for dual units requires improvement in the regulation accuracy over present designs. An advanced regulator concept was prepared featuring redundant bellows, all metallic/ceramic construction, friction-free guidance of moving parts, gas damping, and the elimination of coil springs normally used for reference forces. The activities included testing of actual size seat/poppet components to determine actual discharge coefficients and flow forces. The resulting data was inserted into the computer model of the regulator. Computer simulation of the propulsion module performance over two mission profiles indicated satisfactory minimization of propellant residual requirements imposed by regulator performance uncertainties. Author

N74-30249*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF FORWARD VELOCITY AND ACOUSTIC

TREATMENT ON INLET FAN NOISE
Charles E. Feiler and James E. Merriman (Douglas Aircraft, Co., Long Beach, Calif.) 1974 21 p refs Presented at the Sixth Aircraft Design Flight test and Operations Meeting, Los Angeles, 12-14 Aug. 1974; sponsored by the American Institute of Aeronautics and Astronautics
(NASA-TM-X-71591; E-8045) Avail: NTIS HC $3.00 CSCL 21E

Flyover and static noise data from several engines are presented that show inlet fan noise measured in flight can be lower than that projected from static tests for some engines. The differences between flight and static measurements appear greatest when the fan fundamental tone due to rotor-stator interaction or to the rotor alone field is below cutoff. Data from engine and fan tests involving inlet treatment on the walls only are presented that show the attenuation from this treatment is substantially larger than expected from previous theories or flow duct experience. Data showing noise shielding effects due to the location of the engine on the airplane are also presented. These observations suggest that multiringed inlets may not be necessary to achieve the desired noise reduction in many applications. Author

N74-30250*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TEST TECHNIQUES FOR OBTAINING OFF-NOMINAL COMPRESSOR DATA DURING ENGINE TESTS
Thomas J. Biesiadny 1974 18 p refs Proposed for presentation at the Aerospace Engr. and Manuf. Meeting, San Diego, Calif., 30 Sep. - 3 Oct. 1974; sponsored by the Society of Automotive Engineers
(NASA-TM-X-71597; E-8062) Avail: NTIS HC $3.00 CSCL 21E

Several unique techniques and related devices are described which are in use at the Lewis Research Center for off-design testing of fan and compressor sections in full-scale jet engines. The devices presented permit a wide range of experimental conditions and minimize downtime for hardware changes. The techniques involve use of such devices as inlet pressure distortion jets, a hydrogen burner for inlet temperature distortions, fan back pressure jets to simulate a variable area nozzle, and either an inflow-outflow bleed system or a fuel spurt system to alter compressor discharge pressure. Author

N74-30251# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CALCULATION OF THE ACOUSTIC CHARACTERISTICS OF A SOLID CASCADE OF PLATES
M. A. Trakhtenbroit 17 Apr. 1974 16 p refs Transl. into ENGLISH from Sb. Statei Lopatochnye Mashiny Struynye Apparaty (USSR), no. 6, 1972 p 97-105
(AD-778805; FTD-HT-23-672-74) Avail: NTIS CSCL 21/5

A method for determining the acoustic properties of turbine blades caused by vibration of the blades is presented. The conditions for the formation of acoustic resonance are analyzed with respect to the frequencies of the natural vibrations of gas in the cascade and the characteristics of the dissipation of acoustic energy. Mathematical models are developed to show the relationships of the parameters. It is shown that there are conditions at which the acoustical quality factor reaches high values, which can be a dangerous condition in gas turbine engines. Author

N74-30252# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
INDIVIDUAL MOTOR REPORT. M55A1 MINUTEMAN OPERATIONAL QUALITY ASSURANCE ROCKET MOTOR QA-1304, 0013944
C. W. Shoun 27 Feb. 1974 104 p
(Contract F04701-72-C-0193)
(AD-779700; TWR-7770; SAMSO-TR-74-121) Avail: NTIS CSCL 21/8

The report describes a quality assurance test of a Stage I Minuteman Motor QA-1304. It presents a detailed motor performance analysis. Test objectives were; demonstrate that the Stage I Motor shall meet the performance requirements defined in Model Specification S-133-1001-0-3; demonstrate that the Stage I Motor meets the reliability requirements of document, TRW-6121-8429-TC-000; demonstrate the average values of ballistic performance and reproducibility; demonstrate the performance of the TVC nozzle system; and, demonstrate the performance of the liner with the new MAPO and ERL-510. Author (GRA)

N74-30253# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
FREE SIPHON REPLACEMENT Final Report, Jul. - Sep. 1973
Kenneth C. Miller Dec. 1973 39 p
(AF Proj. 469A)
(AD-777894; AFRPL-TR-73-106) Avail: NTIS CSCL 21/8

The AFRPL has completed a series of tests to evaluate a potential replacement for the free siphon employed on the High Altitude Supersonic Target (HAST) vehicle. These tests were initiated following the demonstrated failure potential of the original free siphon device used on the HAST. The test article consisted of an off-the-shelf stainless steel welded metal bellows to replace that part of the siphon which originally consisted of a Teflon-covered stainless steel helical spring. (Modified author abstract) Author

N74-30254# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STRESS-RUPTURE STRENGTH OF TURBINE BLADE ROOT CONNECTIONS
V. P. Dubinin and V. V. Osasyuk 18 Apr. 1974 10 p refs Transl. into ENGLISH from Energomashinostroenie (USSR), no. 12, 1971 p 41-42
(AD-779159; FTD-HT-23-1195-74) Avail: NTIS CSCL 21/5

Tests were conducted to determine the magnitudes of centrifugal force and the stress acting at a specified cross of a turbine rotor blade. Stress-rupture tests were conducted on blade material in the form of smooth cylindrical samples to establish baseline data points. Strain gages were used to measure the deformation at the selected points on the turbine blades. It was determined that the high concentration of stress in the cross section of the blade indicates that the blade should be manufactured from a plastic material which is not subject to embrittlement during prolonged operation at high temperature conditions. Author

N74-30255# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MUFFLER SYSTEM FOR A SETUP USED IN A STUDY OF TURBINE-BLADE COOLING
L. G. Kasatkina 18 Apr. 1974 11 p refs Transl. into ENGLISH from Energeticheskoe Mashinost. (USSR), no. 9, 1970 p 124-128
(AD-779651; FTD-HT-23-1103-74) Avail: NTIS CSCL 21/5

The development of a test facility for studying the cooling of blades in a gas turbine is discussed. Methods for reducing the noise of the engine exhaust during testing were investigated. The sources and characteristics of the noise generation are analyzed. The design and development of the muffler system used to reduce the noise level are described. The mathematical procedure for determining the dimensions of the muffler is explained. Curves are included to show the noise levels at various locations within the test facility. Author

N74-30256# Pratt and Whitney Aircraft, West Palm Beach, Fla.
LOW-POWER TURBOPROPULSION COMBUSTOR EXHAUST EMISSIONS. VOLUME 2: DEMONSTRATION AND TOTAL EMISSION ANALYSIS AND PREDICTION Final Technical Report, 1 Dec. 1972 - 28 Feb. 1974
Stanley A. Mosier and Richard Roberts Apr. 1974 231 p refs
(Contract F33615-71-C-1870; AF Proj. 3066)
(AD-779786; PWA-FR-6098; AFAPL-TR-73-36-Vol-2) Avail: NTIS CSCL 21/5

An exploratory development program was conducted to identify, evaluate, and demonstrate improved combustion design techniques for increasing combustion efficiency at part-power operating conditions, thereby reducing undesirable and potentially hazardous exhaust emissions. The most promising of the low-power design techniques investigated, fuel-air premixing and

virtual staging, were incorporated into an annular burner configuration and a detailed experimental evaluation of the combustion system was accomplished. The burner was examined at both low-power and simulated design-point operating conditions. Relative to the part-power goals that served as guidelines for the demonstration hardware, viz. a Smoke Number less than 20, carbon monoxide concentration of 10 ppmw, total unburned hydrocarbon concentration of 10 ppmw, and combustion efficiency greater than 98%, those relating to smoke, hydrocarbon concentration, and efficiency were exceeded; that relating to carbon monoxide concentration was approached. A detailed, computerized, theoretical model developed earlier in the program to predict the emission characteristics of combustion systems at part power was used to support the demonstration burner program. (Modified author abstract) GRA

N74-29856* Kanner (Leo) Associates, Redwood City, Calif.
THE PROBLEM OF CARRYING OUT A DIAGNOSIS OF AN INTERNAL COMBUSTION ENGINE BY VIBROACOUSTICAL PARAMETERS
V. N. Lukanin and V. I. Sidorov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 247-249 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 219-221 (For availability see N74-29785 19-15)
CSCL 21A

N74-29875* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE POSSIBILITY OF USE OF VIBROACOUSTICAL SIGNALS FOR PURPOSES OF DIAGNOSTICS IN AERONAUTICAL ENGINEERING
A. R. Press *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 317-319 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 284-285 (For availability see N74-29785 19-15)
CSCL 21A

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-30257*# Stanford Univ., Calif. Inst. for Plasma Research.
AN INVESTIGATION OF THE STRUCTURE AND COMPOSITION OF THE SOLAR ATMOSPHERE USING X-RAY AND EUV SPECTRA OBTAINED WITH THE OV1-17 AND OSO-4 AND OSO-5 SATELLITES Semiannual Status Report, 1 Jan. - 30 Jun. 1974
A. B. C. Walker, Jr. Jul. 1974 50 p refs
(Grant NGR-05-020-695)
(NASA-CR-138944; SASR-1) Avail: NTIS HC $5.50 CSCL 03B

Studies of the structure and composition of the solar corona were undertaken, using a number of satellite observations of the coronal X-ray spectrum. A systematic technique was developed to carry out the required analysis, and the analytical techniques available to calculate the coronal spectrum have been developed and improved. A review of other analyses of solar coronal structure is also included. Author

N74-30258*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANTETARY STREAMS AND THEIR INTERACTION WITH THE EARTH
L. F. Burlaga Jul. 1974 60 p refs Submitted for publication (NASA-TM-X-70714; X-692-74-216) Avail: NTIS HC $6.00 CSCL 03B

Plasma and magnetic field observations of interplanetary streams near 1 AU are summarized. Two types of streams have been identified corotating streams and flare-associated, and other flow patterns are present due to interactions among streams. The theory of corotating streams, which attributes them to a high temperature region near the sun, satisfactorily explains many of the effects observed at 1 AU. A correspondingly complete theory of flare-associated streams does not exist. Streams are a key link in the chain that connects solar and geomagnetic activity. The factors that most influence geomagnetic activity are probably related to streams and determined by the dynamics of streams. The evolution of streams on scales of 27 days and 11 years probably determines the corresponding variations of geomagnetic activity. Author

N74-30259*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGETIC SOLAR PROTON VERSUS TERRESTRIALLY TRAPPED PROTON FLUXES FOR THE ACTIVE YEARS 1977 - 1983
J. H. King and E. G. Stassinopoulos Jul. 1974 15 p refs
(NASA-TM-X-70716; X-601-74-221) Avail: NTIS HC $4.00 CSCL 03B

Ratios of solar to trapped proton fluences were computed for circular-orbit, geocentric space missions to be flown during the active phase of the next solar cycle (1977-1983). The ratios are presented as functions of orbit altitude and inclination, mission duration, proton energy threshold, and the chance the mission planner is willing to take that the actually encountered solar proton fluence will exceed the design fluence provided by the statistical solar proton model. It is shown that the ratio is most sensitively dependent on orbit altitude and inclination, with trapped protons dominant for low inclination, low and mid altitude orbits and for high inclination, mid altitude orbits. Conversely, solar protons are dominant for high inclination, low altitude orbits, and for low and high inclination, high altitude orbits. Author

N74-30260*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF POLLUTANT GASES ON OZONE PRODUCTION BY SIMULATED SOLAR RADIATION
E. L. Wong and David A. Bittker 1974 30 p refs Presented at 2d Intern. Conf. on the Environ. Impact of Aerospace Operations in the High Atmosphere, San Diego, Calif., 8-10 Jul. 1974; sponsored by Am. Meteorol. Soc. and the AIAA
(NASA-TM-X-71573; E-8013) Avail: NTIS HC $3.25 CSCL 03B

Experiments using simulated solar radiation in a chamber, with a controlled atmospheric pressure near 1 atmosphere, were conducted to evaluate O3 production. The effects of CO and H2O were analyzed to determine if the CO and H2O addition could reduce NO destruction of O3. The results show that NO is destroyed while destroying O3. M.C.F.

N74-30261# Brookhaven National Lab., Upton, N.Y.
POSSIBILITY OF RECONCILING THE DISPARITY BETWEEN THEORETICAL PREDICTIONS AND EXPERIMENTAL OBSERVATION OF SOLAR NEUTRINOS
G. E. Kocharov 1973 7 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz.-Tekhn. Inst. (Leningrad), no. 453, 1973 (BNL-TR-558) Avail: NTIS HC $3.00

A new approach to reconciling the discrepancy between theory and experiment in solar neutrino flux is considered. It is concluded that if the high-energy particles turn out for some reason to be fewer in number than predicted by the Maxwellian distribution, the energy released from the solar interior can be attributed to hydrogen burning and the high-energy neutrino flux will be depressed markedly. Author (NSA)

N74-30262# Brookhaven National Lab., Upton, N.Y.
ISOTOPES OF HYDROGEN AND HELIUM IN SOLAR CORPUSCULAR FLUX
G. E. Kocharov [1973] 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Fiz. (Moscow), v. 37, no. 6, 1973 p 1228-1234
(BNL-TR-554) Avail: NTIS HC $3.00

An attempt was made to examine three problems: (1) isotopic composition of the solar wind; (2) nuclear reactions on the surface of the sun and isotopes of He and H in solar cosmic radiation; and (3) solar neutrinos. Author (NSA)

N74-30263# Tokyo Univ., Tanashi (Japan). Inst. for Nuclear Study.

DETECTION OF COSMIC RAY PRODUCED RADIONUCLIDES BY MEANS OF A LOW BACKGROUND COUNTING SYSTEM: DESCRIPTION OF THE PROBLEMS IN THE PROJECT

K. Kobayashi (Waseda Univ.), K. Nogami (Waseda Univ.), T. Shimamura, T. Ohyane (Waseda Univ.), Y. Tazawa (Kyoto Univ.), K. Yamakoshi, and S. Yanagita 7 May 1973 67 p refs In JAPANESE; ENGLISH summary

(INS-TCA-29) Avail: AEC Depository Libraries

Detection of cosmic ray produced radionuclides contained in extraterrestrial dusts accreted on the earth is studied. In Part I, the expected specific activities of Na-22, Al-26, Mn-53, Fe-55, Co-56, and Ni-59 in extraterrestrial dust are estimated with the assumption of radioactive equilibrium in the interplanetary space. The radionuclides of Al-26 and Ni-59 extracted from deep-sea sediments are expected to be mostly realizable by means of a low-background counting system. If a large scale dust collection method is reliable, the detection of short lived nuclides, Na-22, fe-55, and Co-56 is also hopeful. The detector system for gamma ray countings is studied. Impurity components in various materials for the counter system are surveyed, and the influences of a few background components are discussed.

Author (NSA)

N74-30264# Chulalongkorn Univ., Bangkok (Thailand). Dept. of Physics.

THE FINE STRUCTURE OF THE SOLAR CHROMOSPHERE Interim Report, 1 Feb. - 30 Sep. 1973

Rawi Behavilai 30 Nov. 1973 23 p refs

(Grant DA-RDRF-S92-544-73-G201; DA Proj. 2M0-61102-B-52B)

(AD-779434; FE-344-4) Avail: NTIS CSCL 03/2

The solar limb has been studied visually and photographically in the light of H alpha and the combined results are reported. The appearance of a spicule changes with wavelength settings. Effects due to changes of spicule velocities with height and opacity-wavelength relations are indicated. A number of bright spicules seen in the wings are identified with bright mottles seen in the line core. The dark band appears between delta lambda = plus or minus 1.0 A and Delta lambda = plus or minus 0.70 A. Examination of a small mottle cluster in a series of photographs taken in steps from H alpha + 0.85 A to H alpha + 0.10 A leads to a three-dimensional model of a typical mottle cluster. Author (GRA)

N74-30265# Aerospace Corp., El Segundo, Calif. Lab Operations.

SOLAR PROTON OBSERVATIONS AT THE SYNCHRONOUS ALTITUDE DURING THE CINOF TIME PERIOD

J. Blake and George A. Paulikas 6 May 1974 16 p refs

(Contract F04701-73-C-0074)

(AD-779682; TR-0074(4260-20)-12; SAMSO-TR-74-114) Avail: NTIS CSCL 04/1

Data were acquired during the CINOF time period of 5-29 June 1972 with The Aerospace Corporation omnidirectional spectrometer aboard the synchronous altitude spacecraft ATS-1 (1966-110A). During the CINOF time period, the ATS-1 instrument countrate was substantially above background during 8-10 June and 16-20 June. A proton intensity increase was observed at 1312 UT on 17 June resulting from a sudden commencement. At three other times, substantial proton enhancements were observed, presumably due to a change in the interplanetary particle and field configuration. Author (GRA)

N74-30266# Aerospace Corp., El Segundo, Calif.

RELATIVE INTENSITIES OF THE LYMAN LINES OF HYDROGEN-LIKE OXYGEN, MAGNESIUM, AND SILICON IN THE SOLAR CORONA Technical Report, Sep. 1973 - Feb. 1974

Hugo R. Rugge and Arthur B. C. Walker, Jr. 30 Apr. 1974 24 p refs

(Contract F04701-73-C-0074)

(AD-779013; TR-0074(9260-02)-5; SAMSO-TR-74-103) Avail: NTIS CSCL 03/2

Observations of the relative intensities of the Lyman lines of hydrogen-like O VIII, Mg XII, and Si XIV in the solar corona have been made by satellite-based X-ray crystal spectrometers and are reported here. A comparison between the experimentally observed values of the intensity ratio of the Lyman alpha to the Lyman beta line (Lyman ratio) has been made with the recent theoretical predictions of this ratio by Hutcheon and McWhirter for low density plasmas. Good agreement is found between the theory and observations for those times for which we have derived a valid coronal temperature model and applied it to the temperature-dependent theoretical ratio. Observations made at times of greater solar activity appear to be inconsistent with the theory. Author (GRA)

N74-30267# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

AN EXTENDED SET OF COSMIC RAY VARIATIONAL COEFFICIENTS

R. E. Gold, D. S. Peacock, M. A. Shea, and D. F. Smart 4 Feb. 1974 87 p refs

(Contract F19628-73-C-0070; AF Proj. 8600)

(AD-779678; AFCRL-SR-173; AFCRL-TR-74-0063) Avail: NTIS CSCL 04/1

Variational coefficients quantitatively relate cosmic-ray spatial anisotropies and spectral changes to variations in ground-based cosmic-ray monitor counting rates. The concept of the variational coefficients was introduced in 1963, and two sets of tables have been published, yet rarely used. One reason for their low usage is related to the specialization of the existing tables for studies of diurnal variations. The authors have calculated variational coefficients that are applicable to the analysis of a wide variety of transient cosmic-ray phenomena. They differ from the existing tables in that they are calculated for (1) a wide range of upper limiting rigidities from 29 to 500 GV; (2) power law rigidity spectra extending to exponents as high at -1.6; (3) spatial profiles independent of latitude; and (4) longitudinal profiles including square waves of 10 degrees, 30 degrees, 60 degrees, and an isotropic case. Author (GRA)

N74-30268# North Carolina State Univ., Raleigh. Dept. of Physics.

PARTICLE FLUXES ASSOCIATED WITH SOLAR FLARES Final Report

A. W. Waltner and G. J. Oliver May 1974 175 p refs

(Contract DAAD05-69-C-0294; DNA Proj. NWET-K01AAXH)

(AD-779498; BRL-CR-151) Avail: NTIS CSCL 04/1

An investigation of particle fluxes associated with solar flares was carried out with rocket-borne instrumentation. Two instruments were flown on each of six NIKE Javelin rockets from Ft. Churchill, Canada subsequent to the onset of the PCA event of November 1969. The first instrument consisted of a three-counter telescope detecting electrons, protons, alphas, and gamma rays. Data were obtained at altitudes of about 40 to 130 kilometers with seven logic outputs representing various energy intervals for electrons, protons, alpha particles, and gamma rays. Flux variations with time are observed over a period of about 50 hours and are compared with available satellite data. The second instrument contained a silicon avalanche detector designed for low-energy electrons. A magnetic field is cyclically applied to separate low-energy electrons from high-energy particulate or photon radiation. From this instrument is obtained count rate and spectral data for low-energy electrons. Comparisons of four separate launches are made to demonstrate the flux variation over a period of several days. (Modified author abstract) GRA

N74-30269# Naval Research Lab., Washington, D.C.

A PICTORIAL REVIEW OF OSO 7 WHITE LIGHT CORONAGRAMS AND EXTREME ULTRAVIOLET HELIOGRAMS Interim Report

R. T. Seal, D. E. Roberts, and J. D. Whitney 11 Apr. 1974 17 p

(NRL Proj. A01-34)

(AD-779259) Avail: NTIS CSCL 03/2

Since September 29, 1971, two NRL experiment instruments aboard Orbiting Solar Observatory (OSO 7) have been receiving daily images of the solar disk in the far ultraviolet, which is invisible from the ground, and of the white light solar corona, which is seen only during eclipses. This report gives a brief description of the instruments and shows a series of daily pictures

covering one solar rotation. Besides daily changes, the series shows examples of other newly observed phenomena, such as close passage of the planet Jupiter and the moon ultraviolet coronal holes, and a transient coronal event. Author (GRA)

N74-30270# Liege Univ., Cointe-Sclessin (Belgium). Inst. d'Astrophysique.
HIGH RESOLUTION SOLAR SPECTRA Final Scientific Report, 16 Dec. 1971 - 15 Dec. 1973
Marcel V. Migeotte 15 Mar. 1974 11 p
(Grant AF-AFOSR-2317-72; AF Proj. 7670)
(AD-779249; AFCRL-TR-73-0593) Avail: NTIS CSCL 03/2

The report describes investigations being undertaken on high resolution solar spectra obtained at the Jungfraujoch and high resolution solar spectra obtained by balloon. GRA

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-30271 Washington Univ., Seattle.
INTENSITY INTERFEROMETRY IN THE SPATIAL DOMAIN Ph.D. Thesis
Paul Hamilton Deitz 1973 83 p
Avail: Univ. Microfilms Order No. 74-15538

Intensity interferometry, as developed by Hanbury Brown and Twiss for stellar observation, has shown relative insensitivity to atmospheric scintillation. However, with classical sources, the limitations placed on this technique by quantum noise and detector efficiency are severe. This situation is vastly improved when laser illumination is employed. A modification of the Hanbury Brown-Twiss experiment is described whereby intensity correlation is performed using coherent light and the statistical averages are taken in the space domain. The results derived for the spatial detection of intensity fluctuations are shown to be similar to previous results dealing with the phenomenon of laser speckle in terms of the spatial transform relations. Dissert. Abstr.

N74-30272 Texas Univ., Austin.
RADIO SOURCES IN CLUSTERS OF GALAXIES Ph.D. Thesis
Frazer Nelson Owen 1974 212 p
Avail: Univ. Microfilms Order No. 74-14744

Observations designed to obtain accurate positions, structure information, and total flux densities for radio sources in clusters of galaxies were carried out. Data were collected with the broadband synthesis interferometer and the 300 foot telescope. Radio positions accurate to 1 to 2 arc seconds and structure information on over 200 radio sources in Abell clusters of galaxies were measured at 365 MHz. Observations of over 500 Abell clusters were made at 1400 MHz. Similar data were obtained for about 100 radio sources in clusters at 2695 MHz. Results of the observations are presented including optical identification of about 30 radio galaxies in addition to structure information on a scale from 20" to 60" for all the radio sources detected. The 1400 MHz radio luminosity function for emission from Abell clusters was also calculated. Correlations of various radio, optical, and X-ray properties of cluster galaxies are examined.
Dissert. Abstr.

N74-30273 Texas Univ., Austin.
FILTERING THEORY METHODS AND APPLICATIONS TO THE ORBIT DETERMINATION PROBLEM FOR NEAR EARTH SATELLITES Ph.D. Thesis
Kenneth Alan Myers 1974 306 p
Avail: Univ. Microfilms Order No. 74-14739

Selected filtering methods are developed and applied in computer simulations to the orbit determination problem for near-earth satellites. First-order and second-order nonlinear filters are derived, and it is shown that the first-order, or extended Kalman filter, effectively eliminates errors due to linearization assumptions. A general dynamical model compensation algorithm is presented, and new results indicate that significant improvement in estimation accuracy can be obtained in the presence of unmodeled accelerations, and that an analytical, closed-form development of this algorithm offers a potential for even greater accuracy. Square root filtering implementations are shown to be competitive with conventional algorithms in terms of computational requirements. Dissert. Abstr.

N74-30274*# Essex Corp., Alexandria, Va.
TELEOPERATOR DOCKING SIMULATION
Mark Kirkpatrick and Ronald G. Brye Jan. 1974 32 p
(Contract NAS8-28298)
(NASA-CR-120220; H-4-4) Avail: NTIS HC $4.75 CSCL 05H

A simulation study is described of the translation, station keeping and final approach segments of the teleoperator implemented at MSFC. An effort is made to identify the teleoperator visual system design parameters which influence operator performance and to determine human factors design requirements for free flying teleoperators. Author

N74-30275*# Florida Univ., Gainesville. Dept. of Physics and Astronomy.
DETECTION AND ANALYSIS OF JUPITER'S DECAMETRIC MICROPULSES Final Report, 1 Feb. 1971 - 31 Jan. 1972
G. R. Lebo 31 Jan. 1972 14 p
(Grant NGR-10-005-149)
(NASA-CR-138589) Avail: NTIS HC $4.00 CSCL 03B

The occurrence of Jupiter's decametric radio emission can be correlated with the central meridian longitude of Jupiter as if the active regions were radio transmitters placed at fixed longitudes on its surface. These active regions are commonly called sources and are labelled Source A, Jovian longitude = 200 deg, Source B = 100 deg and Source C = 300 deg. These sources are not always active. However, they can be turned-on if Jupiter's innermost Galilean moon, Io, is in the right phase. In fact, if Io is found 90 deg from superior geocentric conjunction (maximum eastern elongation) and if source B is simultaneously on the central meridian, source B radiation is almost guaranteed, whereas source C radiation is highly likely when Io is found 240 deg from superior geocentric conjunction. Source A radiation is largely independent of Io's position. Interestingly, the Io-related radio storms contain unusually rapid events that can only be properly studied using wide-band techniques. Author

N74-30276*# Hawaii Univ., Honolulu. Inst. for Astronomy.
MAUNA KEA OBSERVATORY INFRARED OBSERVATIONS Final Report, 1 Apr. 1972 - 30 Jun. 1974
John T. Jefferies 30 Jun. 1974 6 p refs
(Grant NGR-12-001-111)
(NASA-CR-138965) Avail: NTIS HC $4.00 CSCL 03A

Galactic and solar system infrared observations are reported using a broad variety of radiometric and spectroscopic instrumentation. Infrared programs and papers published during this period are listed. M.C.F.

N74-30277*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPPLEMENT NO. 1 TO THE JANUARY 1974 REPORT ON ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
Richard Horowitz and Leo R. Davis Jul. 1974 159 p
(NASA-TM-X-69913; NSSDC/WDC-A-R/S-74-12) Avail: NTIS HC $11.00 CSCL 22A

Updated information and descriptions on spacecraft and experiments are listed according to spacecraft name and principle experimental investigator. A cumulative index of active and planned spacecraft and experiments is provided; bar graph indexes for electromagnetic radiation experiments are included in table form. G.G.

N74-30278*# Rice Univ., Houston, Tex. Dept. of Space Physics and Astronomy.
OBSERVATIONS OF LOW-ENERGY ELECTRONS UPSTREAM OF THE EARTH'S BOW SHOCK
David L. Reasoner Aug. 1974 17 p refs
(Grant NSG-07025)
(NASA-CR-138309) Avail: NTIS HC $4.00 CSCL 03B

Observations of electron fluxes with a lunar-based electron spectrometer when the moon was upstream of the earth have shown that a subset of observed fluxes are strongly controlled by the interplanetary magnetic field direction. The fluxes occur only when the IMF lines connect back to the earth's bow shock. Observed densities and temperatures were in the ranges 2-4 x 0,001/cu cm and 1.7-2.8 x 1,000,000 K. It is shown that these electrons can account for increases in effective solar wind electron temperatures on bow-shock connected field lines which have been observed previously by other investigators. It is further shown that if a model of the bow shock with an electrostatic potential barrier is assumed, the potential can be estimated to be 500 volts. Author

N74-30279# Committee on Science and Astronautics (U. S. House).
BRIEFING BY SKYLAB 4 ASTRONAUTS
Washington GPO 1974 45 p Hearing before the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 34, 23 Apr. 1974
(H-34-749) Avail: Comm. on Sci. and Astronaut.

The proceedings of a Congressional briefing by Skylab 4 astronauts is presented which outlines the three major tasks and several corollary tasks accomplished during the last Skylab mission. Basic conclusions reached about cardiovascular deconditioning and the utility of the lower body negative pressure device used onboard the spacecraft are given. The solar physics research task is explained in terms of objectives accomplished and includes information about solar flares and prominences which were successfully observed. The earth observations task is described and various photographs taken during the mission are shown as they relate to problems in cartography, cloud cover research, pollution monitoring, land use, water management, atmospherics, geological fault surveys, mesometeorology, and ice reporting. The psychological aspects of long duration space flight are also discussed. A.A.D.

N74-30280*# Kanner (Leo) Associates, Annapolis, Md.
THE CONQUEST OF OUTER SPACE IN THE USSR
G. S. Narimanov, ed. Washington NASA Jul. 1974 464 p refs Transl. into ENGLISH of the book "Osvoyeniye Kosmicheskogo Prostranstva v SSSR" Moscow, Nauka Press, 1974 224 p
(Contract NASw-2481)
(NASA-TT-F-15678) Avail: NTIS HC $26.25 CSCL 22C

A collection is presented of TASS reports and articles by leading scientists printed during 1972, showing the achievements of the Soviet Union in the conquest of outer space. The collection reflects the major phases of space research. Author

N74-30281*# Johns Hopkins Univ., Baltimore, Md.
STATISTICAL MODELS OF LUNAR ROCKS AND REGOLITH Final Report
Allan H. Marcus 8 Oct. 1973 6 p refs
(Grant NGR-21-001-080)
(NASA-CR-139314) Avail: NTIS HC $4.00 CSCL 03B

The mathematical, statistical, and computational approaches used in the investigation of the interrelationship of lunar fragmental material, regolith, lunar rocks, and lunar craters are described. The first two phases of the work explored the sensitivity of the production model of fragmental material to mathematical assumptions, and then completed earlier studies on the survival of lunar surface rocks with respect to competing processes. The third phase combined earlier work into a detailed statistical analysis and probabilistic model of regolith formation by lithologically distinct layers, interpreted as modified crater ejecta blankets. The fourth phase of the work dealt with problems encountered in combining the results of the entire project into a comprehensive, multipurpose computer simulation model for the craters and regolith. Highlights of each phase of research are given. Author

N74-30282*# Johns Hopkins Univ., Baltimore, Md. Dept. of Mathematical Sciences.
ON THE DEFINITION OF CRATER SATURATION DIAMETER
Allan H. Marcus Sep. 1972 9 p refs
(Grant NGR-21-001-080)
(NASA-CR-139217; TR-168) Avail: NTIS HC $4.00 CSCL 03B

A theoretical model is developed for determining the diameter D sub p such that the density of lunar craters exceeding D sub p constitutes a specified proportion p of the maximum number that could be observed on a crater-saturated surface. It is shown that this diameter is sensitive to the value of the exponent in the fresh crater size distrobution, and is much more informative than usual log-log plot intercept definition of satureation diameter. Author

N74-30283# Joint Publications Research Service, Arlington, Va.
SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 328
15 Jul. 1974 42 p refs Transl. into ENGLISH from various RUSSIAN publications
(JPRS-62467) Avail: NTIS HC $5.25

Translations and abstracts of articles on meteorology, oceanography, upper atmosphere and space research, astronomy and terrestrial geophysics covering both science news and formal scientific reports are presented. Published details of Soviet space achievements are included. Author

N74-30284*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
A USERS MANUAL FOR A COMPUTER PROGRAM WHICH CALCULATES TIME OPTICAL GEOCENTRIC TRANSFERS USING SOLAR OR NUCLEAR ELECTRIC AND HIGH THRUST PROPULSION
Lester L. Sackett, Theodore N. Edelbaum, and Harvey L. Malchow Jun. 1974 169 p refs
(Contract NAS5-21791; MIT Proj. 55-51300)
(NASA-CR-139038; R-827) Avail: NTIS HC $11.50 CSCL 22A

This manual is a guide for using a computer program which calculates time optimal trajectories for high-and low-thrust geocentric transfers. Either SEP or NEP may be assumed and a one or two impulse, fixed total delta V, initial high thrust phase may be included. Also a single impulse of specified delta V may be included after the low thrust state. The low thrust phase utilizes equinoctial orbital elements to avoid the classical singularities and Kryloff-Boguliuboff averaging to help insure more rapid computation time. The program is written in FORTRAN 4 in double precision for use on an IBM 360 computer. The manual includes a description of the problem treated, input/output information, examples of runs, and source code listings. Author

N74-30285*# Techtran Corp., Glen Burnie, Md.
TRAJECTORIES OF SOLAR SATELLITE FOR RADIO SOUNDING OF CIRCUMSOLAR SPACE
G. A. Mersov Washington NASA Jul. 1974 12 p refs Transl. into ENGLISH of "Trayektorii Sputnika Solntsa dlya Radiosondirovaniya Okolosolnechnogo Prostranstva" Moscow, Acad. of Sci. USSR, Pr-163, 1974 15 p
(Contract NASw-2485)
(NASA-TT-F-15771; Pr-163) Avail: NTIS HC $4.00 CSCL 22A

A heliocentric orbit, symmetrical to the orbit of the earth with reference to the center of the Sun, and called a contra-earth orbit is investigated. While a space sound moves along a contra-earth orbit, the sun, the earth and the sound gradually form a straight line which can be used to carry out experiments relating to the radio sounding or circumsolar space. Methods of putting the sound into a contra-earth orbit are suggested and the magnitudes of velocity of the inserting maneuvers are defined. The perturbed motion of the sound is investigated and the demands for precision in carrying out the insertion maneuvers in limiting circular perturbation are defined. Author

N74-30286*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT ADVANCES IN SATELLITE OBSERVATIONS OF SOLAR VARIABILITY AND GLOBAL ATMOSPHERIC OZONE
Donald F. Heath Jun. 1974 44 p refs
(NASA-TM-X-70712; X-912-74-190) Avail: NTIS HC $5.25 CSCL 03A

The launch of Nimbus 4 in April 1974 has made possible

simultaneous measurements of the ultraviolet solar irradiance and the global distribution of atmospheric ozone by the monitor of ultraviolet solar energy (MUSE) and backscatter ultraviolet (BUV) experiments respectively. Two long lived ultraviolet active solar regions which are about 180 deg apart in solar longitude were observed to be associated with central meridian passages of solar magnetic sector boundaries. The boundaries may be significant in the evaluation of correlations between solar magnetic sector structure and atmospheric circulation. Author

N74-30287*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APPLICATION OF TREND SURFACE ANALYSIS TO A PORTION OF THE APOLLO 15 X-RAY FLUORESCENCE DATA
M. H. Podwysocki (Maryland Univ., College Park), J. R. Weidner (Maryland Univ., College Park), C. G. Andre (Maryland Univ., College Park), A. L. Bickel (Maryland Univ., College Park), R. S. Lum (Maryland Univ., College Park), I. Adler (Maryland Univ., College Park), and J. I. Trombka May 1974 13 p refs Presented at Proc. of the 5th Lunar Sci. Conf., Houston, Tex., 18-22 Mar. 1974 Submitted for publication
(NASA-TM-X-70708; X-682-74-129) Avail: NTIS HC $4.00 CSCL 03B

X-ray fluorescence data for 8 and 16 second time integrals gathered by Apollo 15 in circum lunar orbit were analyzed to determine the capability for chemical mapping of relatively small lunar features in a portion of Tranquillitatis and Serenitatis basins. Spatial mapping using trend surface analysis demonstrated that a useable signal could be extracted from Al/Si intensity ratios calculated for 8 second time spans. Reliability of the Al/Si ratio was enhanced when 16 second data were compiled using a sliding average technique. Residual anomalies from the trend surface mapping were identified and correlated with relatively small lunar surface features. Author

N74-30288*# New York Univ., N.Y.
ELECTRON AND ION DENSITIES IN INTERSTELLAR CLOUDS
A. E. Glassgold and William D. Langer 1974 29 p refs
(Grant NGR-33-016-196)
(NASA-CR-138964) Avail: NTIS HC $4.25 CSCL 03B

A quantitative theory of ionization in diffuse clouds is developed which includes H(+) charge exchange with O. Dissociative charge exchange of He(+) with H2 plays an important role in the densities of H(+) and He(+). The abundance of HD is also discussed. Author

N74-30289*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VENUS CLOUD PROPERTIES: INFRARED OPACITY AND MASS MIXING RATIO
R. E. Samuelson, R. A. Hanel, L. W. Herath, V. G. Kunde, and W. C. Maguire Jun. 1974 51 p refs Submitted for publication
(NASA-TM-X-70713; X-622-74-191) Avail: NTIS HC $5.75 CSCL 03B

By using the Mariner 5 temperature profile and a homogeneous cloud model, and assuming that CO2 and cloud particles are the only opacity sources, the wavelength dependence of the Venus cloud opacity is inferred from the infrared spectrum of the planet between 450 and 1250/cm. Justification for applying the homogeneous cloud model is found in the fact that numerous polarization and infrared data are mutually consistent within the framework of such a model; on the other hand, dense cloud models are not satisfactory. Volume extinction coefficients varying from 0.000005 to 0.000015/cm depending on the wavelength, are determined at the tropopause level of 6110 km. By using all available data, a cloud mass mixing ratio of approximately 0.000005 and a particle concentration of about 900 particles per cu cm at this level are also inferred. The derived cloud opacity compares favorably with that expected for a haze of droplets of a 75% aqueous solution of sulfuric acid. Author

N74-30290*# Martin Marietta Corp., Baltimore, Md.
A FEASIBILITY STUDY OF UNMANNED RENDEZVOUS AND DOCKING IN MARS ORBIT: MIDTERM REVIEW
Mar. 1974 282 p Prepared for JPL
(Contract JPL-953746)
(NASA-CR-139285) Avail: NTIS HC $17.25 CSCL 22A

The ascent, rendezvous, docking and sample transfer operations in a potential MSSR mission that uses the Mars orbital rendezvous mode are considered. In order that the design choices made for these operations remain compatible with the rest of the mission, the impact on the Earth launch, Mars landing and orbiting and Earth return phase are also being assessed. The selection and description of a preliminary baseline concept are presented. Author

N74-30291*# California Inst. of Tech., Pasadena.
HYDROGEN AND FLUORINE IN THE SURFACES OF LUNAR SAMPLES
D. A. Leich, R. H. Goldberg, D. S. Burnett, and T. A. Tombrello Apr. 1974 30 p refs
(Grants NGR-05-002-333; NSF GP-28027)
(NASA-CR-139299) Avail: NTIS HC $4.50 CSCL 03B

The resonant nuclear reaction F-19 (p, alpha gamma)0-16 has been used to perform depth sensitive analyses for both fluorine and hydrogen in lunar samples. The resonance at 0.83 MeV (center-of-mass) in this reaction has been applied to the measurement of the distribution of trapped solar protons in lunar samples to depths of about 1/2 micrometer. These results are interpreted in terms of terrestrial H2O surface contamination and a redistribution of the implanted solar H which has been influenced by heavy radiation damage in the surface region. Results are also presented for an experiment to test the penetration of H2O into laboratory glass samples which have been irradiated with O-16 to simulate the radiation damaged surfaces of lunar glasses. Fluorine determinations have been performed in a 1 pm surface layer on lunar samples using the same F-19 alpha gamma)0-16 resonance. The data are discussed from the standpoint of lunar fluorine and Teflon contamination. Author

N74-30292*# Washington Univ., St. Louis, Mo. Lab. for Space Physics.
LUNAR SAMPLE CONTRACTS Final Report, 1 Jul. 1968 - 31 Jan. 1971
Robert M. Walker May 1974 168 p refs
(Contract NAS9-8165)
(NASA-CR-134321) Avail: NTIS HC $17.50 CSCL 03B

The major scientific accomplishments through 1971 are reported for the particle track studies of lunar samples. Results are discussed of nuclear track measurements by optical and electron microscopy, thermoluminescence, X-ray diffraction, and differential thermal analysis. F.O.S.

N74-30293*# Lowell Observatory, Flagstaff, Ariz.
PLANETARY RESEARCH CENTER Final Report, 1 Jul. 1968 - 30 Jun. 1974
William A. Baum, Robert L. Millis, and Edward L. G. Bowell 31 Jul. 1974 73 p refs Original contains color illustrations
(Grant NGR-03-003-007)
(NASA-CR-138941) Avail: NTIS HC $6.75 CSCL 03A

Extensive Earth-based photography of Mars, Jupiter, and Venus is presented which monitors the atmospheric and/or surface changes that take place day to day. Color pictures are included of the 1973 dust storm on Mars, showing the daily cycle of the storm's regeneration. Martian topography, and the progress of the storm is examined. Areas most affected by the storm are summarized. M.C.F.

N74-30294# Owens Valley Radio Observatory, Pasadena, Calif.
APERATURE SYNTHESIS OF FORMALDEHYDE ABSORPTION IN SGR A
J. B. Whiteoak, D. H. Rogstad, and I. A. Lockhart 1974 21 p refs
(Contract N00014-67-A-0019)
(AD-779370; Rept-1974-4) Avail: NTIS CSCL 03/2

Synthesis observations of the 4830 MHz formaldehyde absorption originating near Sgr A are presented. The synthesized beamwidth is 20 arc sec in right ascension and 40 arcsec in declination. The velocity resolution is 6.2/kms. The results suggest that the broad -40/kms absorption feature arises in two separate dense molecular clouds behind, and moving away from, the center of the galaxy. Author (GRA)

N74-30295# Owens Valley Radio Observatory, Pasadena, Calif.
A HIGH RESOLUTION NEUTRAL HYDROGEN STUDY OF GALLAXY M81
L. Weliachew and S. T. Gottesman 1974 68 p refs Prepared in cooperation with Florida Univ., Gainesville
(Contract N00014-67-A-0094-0019)
(AD-779372; Rept-1974-6) Avail: NTIS CSCL 03/2

Observations of the galaxy M81 (NGC 3031) have been made using the two element interferometer of the Owens Valley Radio Observatory. Operating at the appropriate Doppler-shifted neutral hydrogen frequency a resolution of 2 arc min is synthesized which is equivalent to 1.9 kpc at a distance of 3.25 Mpc. GRA

N74-30296# Owens Valley Radio Observatory, Pasadena, Calif.
APERTURE SYNTHESIS OBSERVATIONS OF HI IN THE GALAXY M83
D. H. Rogstad, I. A. Lockhart, and M. C. H. Wright 1974 31 p refs
(Contract N00014-67-A-0094-0019)
(AD-779371; Rept-1974-5) Avail: NTIS CSCL 03/2

High resolution observations of neutral hydrogen in the spiral galaxy M83 reveal a very extended HI distribution and a peculiar velocity field. An interpretation is presented in terms of substantial warping of the plane of the galaxy for the material outside the optical image. The time scale for persistence of this bending is estimated to be longer than two billion years. (Author) GRA

N74-30297*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ELECTROSTATIC AND ELECTROMAGNETIC TURBULENCE ASSOCIATED WITH THE EARTH'S BOW SHOCK
Paul Rodriguez and Donald A. Gurnett Apr. 1974 60 p refs
(Contracts NAS5-11074; NAS5-11431; Grant
NGL-16-001-043; Contract N00014-68-A-0196-0009)
(NASA-CR-138311; AD-779051; U-of-Iowa-74-15) Avail: NTIS HC $6.00 CSCL 04/1

The electric and magnetic field spectral densities of plasma waves in the earth's bow shock have been measured in the frequency range 20 Hz to 200 kHz using two 16-channel spectrum analyzers on the IMP-6 spacecraft. (Modified author abstract) GRA

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-30298 British Library Lending Div., Boston Spa (England).
FROM SPUTNIK TO SPACE STATION
Yu. I. Zaitsev 1974 98 p Transl. into ENGLISH of the book "Ot Avtomaticheskikh k Orbital'nym Stantsiyam v Kosmose" Moscow, Chapters 1 and 2, 1970 94 p
Copyright. Avail: British Lending Library, Boston Spa, Engl.: £ 1.50

A general overview of the Soviet space program is presented. Cosmonaut training and life support systems are also described. E.J.O.

N74-30299 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
REAL-TIME OPTIMAL GUIDANCE WITH APPLICATION TO LIFTING RE-ENTRY VEHICLES Ph.D. Thesis
David John South 1973 212 p
Avail: Univ. Microfilms Order No. 74-14939

A real-time optimal guidance scheme based upon the variation of extremals algorithm for obtaining optimal trajectories was formulated in two phases and applied to a planar lifting re-entry problem. First the variation of extremals algorithm was formulated and used in conjunction with a flexible prediction technique to construct an algorithm for rapidly generating optimal trajectories. Then, based also upon the variation of extremals algorithm, an en route optimal guidance algorithm was developed for guiding a vehicle to desired terminal conditions in the presence of perturbations. The optimal guidance scheme was assessed by digital computer simulations of the algorithms applied to a re-entry problem for which the integral of a function of convective heating was being minimized. The algorithm for rapidly generating optimal trajectories permits trajectories to be quickly found for initial re-entry states lying within a large re-entry window. Dissert. Abstr.

N74-30300*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB LESSONS LEARNED
Jul. 1974 74 p
(NASA-TM-X-64860) Avail: NTIS HC $3.75 CSCL 22C

Key lessons learned during the Skylab Program that could have impact on on-going and future programs are presented. They present early and sometimes subjective opinions; however, they give insights into key areas of concern. These experiences from a complex space program management and space flight serve as an early assessment to provide the most advantage to programs underway. References to other more detailed reports are provided. Author

N74-30301# Saab-Scania, Linkoping (Sweden).
PAYLOAD S10 Final Report
11 Apr. 1974 58 p refs Prepared for Swedish Space Corp. Original contains color illustrations
(RRK-S10-74:52) Avail: NTIS HC $6.00 CSCL 22B

The preparation of two payloads for integration onboard a Nike Tomahawk sounding rocket scheduled for launch from Esrange, Kiruna, Sweden is described. Mechanical design drawings and color photographs are provided for the S10-1 and S10-2 payloads, and the separate experiments contained within the payload packages are summarized. The electrical and telemetry systems are discussed and lists are included for payload equipment, channel allocations, and flight sequence data. Performance and structural calculations are also presented. An account of the testing program includes information on dummy tests, spin tests, ejection tests, and mechanical and acceptance tests. Final flight preparation, countdown, and check procedures are fully documented with text and photographs. Both payloads were successfully launched into an auroral substorm on February 20, 1974. A.A.D.

N74-30302*# Systems Research Lab., Champaign, Ill.
RESEARCH STUDY ON STABILIZATION AND CONTROL: MODERN SAMPLED-DATA CONTROL THEORY. CONTINUOUS AND DISCRETE DESCRIBING FUNCTION ANALYSIS OF THE LST SYSTEM Final Report
B. C. Kuo and G. Singh 1 Jan. 1974 158 p
(Contract NAS8-29853)
(NASA-CR-120331) Avail: NTIS HC $11.00 CSCL 22B

The dynamics of the Large Space Telescope (LST) control system were studied in order to arrive at a simplified model for computer simulation without loss of accuracy. The frictional nonlinearity of the Control Moment Gyroscope (CMG) Control Loop was analyzed in a model to obtain data for the following: (1) a continuous describing function for the gimbal friction nonlinearity; (2) a describing function of the CMG nonlinearity using an analytical torque equation; and (3) the discrete describing function and function plots for CMG functional linearity. Preliminary computer simulations are shown for the simplified LST system, first without, and then with analytical torque expressions. Transfer functions of the sampled-data LST system are also described. A final computer simulation is presented which uses elements of the simplified sampled-data LST system with analytical CMG frictional torque expressions. A.A.D.

N74-30303*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex. Applied Mechanics Section.
APOLLO 16 MISSION REPORT. SUPPLEMENT 2: SERVICE PROPULSION SYSTEM FINAL FLIGHT EVALUATION
R. J. Smith and S. C. Wood Jun. 1974 71 p refs
(Contract NAS9-12330)
Avail: NTIS HC $6.75 CSCL 22C

The Apollo 16 Mission was the sixteenth in a series of flights using Apollo flight hardware and included the fifth lunar

landing of the Apollo Program. The Apollo 16 Mission utilized CSM 113 which was equipped with SPS Engine S/N 66 (Injector S/N 137). The engine configuration and expected performance characteristics are presented. Since previous flight results of the SPS have consistsistently shown the existence of a negative mixture ratio shift, SPS Engine S/N 66 was reorificed to increase the mixture ratio for this mission. The propellant unbalance for the two major engine firings is compared with the predicted unbalance. Although the unbalance at the end of the TEI burn is significantly different than the predicted unbalance, the propellant mixture ratio was well within limits. The SPS performed six burns during the mission, with a total burn duration of 575.3 seconds. The ignition time, burn duration and velocity gain for each of the six SPS burns are reported. Author

N74-30304*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SYSTEM FOR SPACECRAFT ATTITUDE CONTROL AND ENERGY STORAGE
John D. Shaughnessy Washington Aug. 1974 78 p refs
(NASA-TN-D-7582; L-9271) Avail: NTIS HC $4.00 CSCL 22B

A conceptual design for a double-gimbal reaction-wheel energy-wheel device which has three-axis attitude control and electrical energy storage capability is given. A mathematical model for the three-axis gyroscope (TAG) was developed, and a system of multiple units is proposed for attitude control and energy storage for a class of spacecraft. Control laws were derived to provide the required attitude-control torques and energy transfer while minimizing functions of TAG gimbal angles, gimbal rates, reaction-wheel speeds, and energy-wheel speed differences. A control law is also presented for a magnetic torquer desaturation system. A computer simulation of a three-TAG system for an orbiting telescope was used to evaluate the concept. The results of the study indicate that all control and power requirements can be satisfied by using the TAG concept. Author

N74-30305*# North American Rockwell Corp., Downey, Calif. Space Div.
SPACE SHUTTLE PHASE B. VOLUME 2: TECHNICAL SUMMARY Final Report
15 Mar. 1972 134 p
(Contract NAS9-10960)
(NASA-CR-134353; MSC-03332-Vol-2) Avail: NTIS HC $9.75 CSCL 22B

A summary of the research in the space shuttle program is presented. Funding constraints, booster requirements, abort modes, launch configurations, environment impact, and test facility impacts are discussed. F.O.S.

N74-30306*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SKYLAB THRUSTER ATTITUDE CONTROL SYSTEM
G. E. Wilmer, Jr. Jul. 1974 121 p
(NASA-TM-X-64852) Avail: NTIS HC $4.50 CSCL 22B

Preflight activities and the Skylab mission support effort for the thruster attitude control system (TACS) are documented. The preflight activities include a description of problems and their solutions encountered in the development, qualification, and flight checkout test programs. Mission support effort is presented as it relates to system performance assessment, real-time problem solving, flight anomalies, and the daily system evaluation. Finally, the detailed flight evaluation is presented for each phase of the mission using system telemetry data. Data assert that the TACS met or exceeded design requirements and fulfilled its assigned, mission objectives. Author

N74-30307*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARATIVE EVALUATION OF EXISTING EXPENDABLE UPPER STAGES FOR SPACE SHUTTLE
Vernon J. Weyers, Gary D. Sagerman, Janos Borsody, and Robert J. Lubick Jun. 1974 104 p refs
(NASA-TM-X-71579; E-8026) Avail: NTIS HC $4.50 CSCL 22B

The use of existing expendable upper stages in the space shuttle during its early years of operation is evaluated. The Burner 2, Scout, Delta, Agena, Transtage, and Centaur were each studied under contract by their respective manufacturers to determine the extent and cost of the minimum modifications necessary to integrate the stage with the shuttle orbiter. A comparative economic analysis of thirty-five different families of these stages is discussed. Results show that the overall transportation system cost differences between many of the families are quite small. However, by considering several factors in addition to cost, it is possible to select one family as being representative of the capability of the minimum modification existing stage approach. The selected family meets all of the specified mission requirements during the early years of shuttle operation. Author

N74-30308*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE SHUTTLE SYSTEM PROGRAM DEFINITION. VOLUME 1: EXECUTIVE SUMMARY Final Report
15 Mar. 1972 49 p
(Contract NAS9-11160)
(NASA-CR-134338; MSC-03824-Vol-1; B-35-43; RP-33) Avail: NTIS HC $5.50 CSCL 22B

A study for the selection of a low cost shuttle system for design and development was conducted. The objective of the final study was to examine and penetrate the major technical and cost issues affecting the choice of the following: (1) liquid propulsion recoverable or solid propulsion recoverable booster, (2) parallel burn/parallel mount or series burn/tandem mount configurations, and (3) payload weight and payload bay size of the orbiter. The matrix of program options which were considered in the study is developed. Author

N74-30309*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE SHUTTLE SYSTEM PROGRAM DEFINITION. VOLUME 2: TECHNICAL REPORT Final Report
15 Mar. 1972 248 p
(Contract NAS9-11160)
(NASA-CR-134339; B35-43-RP-33-Vol-2; MSC-03824-Vol-2) Avail: NTIS HC $15.50 CSCL 22B

The Phase B Extension of the Space Shuttle System Program Definition study was redirected to apply primary effort to consideration of space shuttle systems utilizing either recoverable pressure fed liquids or expendable solid rocket motor boosters. Two orbiter configurations were to be considered, one with a 15x60 foot payload bay with a 65,000 lb, due East, up-payload capability and the other with a 14x45 payload bay with 45,000 lb, of due East, up-payload. Both were to use three SSME engines with 472,000 lb of vacuum thrust each. Parallel and series burn ascent modes were to be considered for the launch configurations of primary interest. A recoverable pump-fed booster is included in the study in a series burn configuration with the 15x60 orbiter. To explore the potential of the swing engine orbiter configuration in the pad abort case, it is included in the study matrix in two launch configurations, a series burn pressure fed BRB and a parallel burn SRM. The resulting matrix of configuration options is shown. The principle objectives of this study are to evaluate the cost and technical differences between the liquid and solid propellant booster systems and to assess the development and operational cost savings available with a smaller orbiter. Author

N74-30310*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE SHUTTLE SYSTEM PROGRAM DEFINITION. VOLUME 4: COST AND SCHEDULE REPORT
15 Mar. 1972 55 p
(Contract NAS9-11160)
(MSC-03824-Vol-4) Avail: NTIS HC $5.75 CSCL 22B

The supporting cost and schedule data for the second half of the Space Shuttle System Phase B Extension Study is summarized. The major objective for this period was to address the cost/schedule differences affecting final selection of the HO orbiter space shuttle system. The contending options under study included the following booster launch configurations: (1) series burn ballistic recoverable booster (BRB), (2) parallel burn ballistic recoverable booster (BRB), (3) series burn solid rocket motors (SRM's), and (4) parallel burn solid rocket motors (SRM's). The implications of varying payload bay sizes for the orbiter, engine type for the ballistics recoverable booster, and SRM motors for the solid booster were examined. Author

N74-30311*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN IMPROVED SYSTEM FOR IMPOSING DIRECTIONAL STABILITY ON A ROCKET-PROPELLED VEHICLE Patent Application
Harold Perkins, inventor (to NASA) Issued 31 Jul. 1974 15 p
(NASA-Case-MFS-21311-1; US-Patent-Appl-SN-493359) Avail: NTIS HC $4.00 CSCL 22B

An improved system for use in imposing directional stability on a rocket-propelled vehicle is discussed. The system includes a pivotally supported engine-mounting platform, a gimbal ring mounted on the platform and adapted to pivotally support a rocket engine, hydraulic actuator connected to the platform for imparting selected pivotal motion, an accelerometer and a signal comparator circuit for providing error intelligence indicative of aberration in vehicle acceleration, and an actuator control circuit connected with the actuator and responsive to error intelligence for imparting pivotal motion to the platform. A relocation of the engine's thrust vector is achieved for imparting directional stability to the vehicle. NASA

N74-30312*# Techtran Corp., Glen Burnie, Md.
THE BIOSATELLITE: RESULTS OF THE EXPERIMENT
O. Gazenko Washington NASA Jul. 1974 9 p Transl. into ENGLISH from Pravda (USSR), no. 60 (20299), 1 Mar. 1974 (Contract NASw-2485)
(NASA-TT-F-15863) Avail: NTIS HC $4.00 CSCL 22B

Results of a 22 day biosatellite flight containing white mice, tortoises, insects, microorganisms and fungi, with duplicated conditions on an earthbound control group to determine effects of weightlessness are presented. Author

N74-30313*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN ANALYSIS OF THE VENERA 8 MEASUREMENTS
John E. Ainsworth and Jay R. Herman Feb. 1974 38 p refs
(NASA-TM-X-70706; X-623-74-37) Avail: NTIS HC $5.00 CSCL 05B

Analysis of the Venera 8 measurements yielded equatorial morning terminator horizontal and vertical winds which are similar to the winds obtained from the Venera 7 measurements. The lower boundary of the horizontal retrograde 4-day wind is defined by a 50-60% decrease in wind speed in the vicinity of 44 km and there exists a retrograde wind plateau of 15 to 40 m/s winds extending from 40 km down to the vicinity of 18 km where the winds decrease rapidly to the order of 0.1 m/s near the surface. Up drafts of 2 to 5 m/s exist in the vicinity of 20 to 30 km and are apparently associated with a slightly super adiabatic lapse rate. The temperature lapse-rate, surface radius, surface topography, and atmospheric structure are discussed. Author

N74-30314*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GENERALIZED TECHNIQUE FOR USING CONES AND DIHEDRAL ANGLES IN ATTITUDE DETERMINATION, REVISION 1
Roger D. Werking Sep. 1973 151 p refs
(NASA-TM-X-70705; X-581-73-292-Rev-1) Avail: NTIS HC $10.75 CSCL 22B

Analytic development is presented for a general least squares attitude determination subroutine applicable to spinning satellites. The method is founded on a geometric approach which is completely divorced from considerations relating to particular types and configurations of onboard attitude sensors. Any mix of sensor measurements which can be first transformed (outside the program) to cone or dihedral angle data can be processed. A cone angle is an angle between the spin axis and a known direction line in space; a dihedral angle is an angle between two planes formed by the spin axis and each of two known direction lines. Many different kinds of sensor data can be transformed to these angles, which in turn constitute the actual program inputs, so that the subroutine can be applied without change to a variety of satellite missions. Either a constant or dynamic spin axis model can be handled. The program is also capable of solving for fixed biases in the input angles, in addition to the spin axis attitude solution. Author

N74-30315*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MSFC SKYLAB ELECTRICAL POWER SYSTEMS MISSION EVALUATION
A. P. Woosley Jun. 1974 500 p
(NASA-TM-X-64818) Avail: NTIS HC $9.75 CSCL 22B

The design, development, and operation of the Skylab electrical power system are discussed. The electrical systems for the airlock module of the orbital workshop and the Apollo telescope mount are described. Skylab is considered an integral laboratory, however, both cluster and module hardware distinct sections are included. Significant concept and requirement evolution, testing, and modifications resulting from tests are briefly summarized to aid in understanding the launch configuration description and the procedures and performance discussed for in-orbit operation. Specific problems encountered during Skylab orbital missions are analyzed. Author

N74-30316# Naval Postgraduate School, Monterey, Calif.
RADIAL PRESSURE ON A GUN LAUNCHED MOTOR CASE DUE TO SLUMPING PROPELLANT Interim Report, Jul. - Sep. 1973
David Salinas and Robert E. Ball Mar. 1974 30 p refs
(AD-777666; NPS-59ZC74031) Avail: NTIS CSCL 19/7

An investigation was undertaken to determine the radial pressure due to the slumping propellant in a gun-launched rocket motor case subject to high axial g loading during launch. Using a Rayleigh-Ritz formulation an approximate solution was obtained. Author (GRA)

N74-30317# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
UNGUIDED ROCKET IMPACT DISPERSION AT WHITE SANDS MISSILE RANGE, NEW MEXICO AND UTAH LAUNCH COMPLEX, GREEN RIVER, UTAH Meteorological data report
David J. Novlan Mar. 1974 37 p refs
(DA Proj. 1T6-65702-D-127)
(AD-779375; DR-821) Avail: NTIS CSCL 19/7

Impact dispersion data are presented for twenty-four unguided sounding rockets launched from White Sands Missile Range, New Mexico, and the Utah Launch Complex at Green River, Utah, during the four-year period 1970-1973. Although dispersion data from 1965 forward could have been included in this report, the four-year period, 1970-1973, was chosen because of the more sophisticated impact prediction and measurement techniques utilized during this period. A scatter diagram is presented for each rocket showing the dispersion of each shot around the predicted impact point. Included on each diagram is the standard error of estimate (total and component form) for each rocket type, a mean algebraic bias in components, and the number of cases on which the calculations were based. All cases involving a known rocket malfunction were excluded from this study. GRA

N74-30318# Frequency and Time Systems, Inc., Danvers, Mass.
CESIUM-ATOMIC BEAM OSCILLATOR TECHNOLOGY FOR NAVIGATION SATELLITES Final Report
1 May 1974 51 p
(Contract N00014-74-C-0061)
(AD-779289; F6174) Avail: NTIS CSCL 14/2

The report presents the results of the initial phase of a program of engineering design work, testing, and analytical studies directed toward the development of cesium beam atomic frequency standards suitable for navigation satellite use. Specific objectives of the initial phase were: Qualification of a cesium beam tube for survival in launch-vehicle environment and reliable operation in satellite environment; analysis of cesium oscillator power requirements, existing art and potential power reduction; and evaluation of remote adjustment requirements, crystal oscillator aging, and other adjustments. GRA

N74-30319# Auburn Univ., Ala. Dept. of Mechanical Engineering.
LAUNCH TUBE AND ROCKET INTERACTION FOR AN AERODYNAMICALLY NEUTRAL SPIN STABILIZED FREE ROCKET Technical Report, 15 Oct. 1972 - 15 Oct. 1973
Joe W. Reece, Gerry A. Lindholm, and William A. Tomb Apr.

1974 137 p refs
(Contract DAAH01-73-C-0226)
(AD-779494) Avail: NTIS CSCL 19/7

A linearized model is developed for the dynamics of a spinning, unbalanced, rigid rocket during the tip-off phase of launch. Mallaunch rates for the rocket are obtained for the short time interval from tip-off to end of guidance. The results show that tip-off should not be a major cause of mallaunch for very high spin rates and short tip-off times. Rocket flexibility is modelled for the launch phase. The model accounts for bearing clearances, a variable stiffness motor section and allows for the 3-D motion of a rigid warhead. The phenomenon of whirling is investigated and the bent configuration of the rocket is calculated for synchronous whirling. The resulting mallaunch rates agree with reported range data. Dynamical equations of motion are developed for a multitube launcher assembly for a spin-stabilized rocket. A parametric study is performed to minimize the mallaunch rates affecting missile flight. The results show that prudent selection of specific structural parameters can minimize mallaunch rates. Author (GRA)

N74-29907* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE PROCESSING EXPERIMENTS ON SOUNDING ROCKETS
Hans F. Weunscher *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 2 Jun. 1974 p 565-579 refs
(For availability see N74-29905 19-15)
CSCL 16D

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-30320 Ceskoslovenska Akademie Ved, Prague.
PHOTOPLASTICITY
Jan Javornicky 1974 343 p refs
Copyright. Avail: Issuing Activity

A comprehensive analysis of stress and strain is presented which focuses on the concept of the birefringent effect in bodies loaded beyond the elastic limit. The fundamentals of the theories of plasticity such as viscoelasticity, creep and relaxation, and viscoplasticity are reviewed. Photoplasticity is discussed on the basis of the underlying physical approaches of birefringence, and the physico-chemical theory of the mechanical deformation of plastics. The problem of evaluation of birefringence in terms of mechanical properties is also discussed. The theory of photoplasticity based on the double nature of birefringence is considered along with explanations of the differences in approach and evaluation. The correspondence between theory and experiment is emphasized and advice is given on the projection and control of experiments. Author

N74-30321 Illinois Univ., Chicago.
THE INITIATION OF SPHERICAL ELASTIC-PLASTIC BOUNDARIES DUE TO LOADING AT A SPHERICAL CAVITY Ph.D. Thesis
Muthukrishnan Gopalsamy Srinivasan 1974 90 p
Avail: Univ. Microfilms Order No. 74-14866

The problem of spherical wave propagation in nonlinearly strain hardening, elastic-plastic materials due to radial stress uniformly applied at a spherical cavity is considered. For a general initial and boundary value problem, a complete solution of the problem may be obtained by numerical approximation. To apply a numerical scheme for this problem, it is essential to know the number and nature of discontinuity fronts initiated at the cavity due to a discontinuity in the prescribed radial stress or its time derivative at the cavity. Efforts were made to determine the initial speeds of the discontinuity fronts and to identify each region separated by these fronts as to whether it is an elastic or plastic region. An inverse method is adopted. Various admissible cases of propagating discontinuity fronts are assumed and the conditions to be satisfied by the boundary stress discontinuity for each case to be valid are determined. Dissert. Abstr.

N74-30322 Georgia Inst. of Tech., Atlanta.
A SCATTERED LIGHT PHOTOELASTIC ANALYSIS OF INTERLAMINAR MATRIX STRESSES IN FIBROUS COMPOSITE MODELS Ph.D. Thesis
Robert Wendell Aderholdt 1973 127 p
Avail: Univ. Microfilms Order No. 74-16128

A scattered light photoelastic analysis of stresses in the matrix of multilayered fiber composite models was conducted. Two tensile specimens are tested. The first contains two mutually normal layers of fibers which are approximately one-half inch in diameter with a one-inch spacing and permits solution for all components of the stress tensor in the region between the fiber layers. The second model is similar to the first, but contains four layers of approximately one-quarter inch fibers for direct solution of matrix interlaminar shear stress. In both models fibers are oriented plus or minus 45 deg with respect to the tensile load. Least-squares methods are used to utilize excess information available from the photoelastic data and the stress equilibrium equations. Dimensional analysis and specially devised molding techniques are used to produce the models. The results indicate that matrix stress magnitudes are a function of proximity to the fibers and that they are significantly higher than the composite stresses commonly obtained using mathematical models.
Dissert. Abstr.

N74-30323 Rutgers Univ., Newark, N.J.
FATIGUE BEHAVIOR OF POLYSTYRENE; EFFECTS OF FLAW SIZE, MEAN STRESS, AND SURFACE COATINGS Ph.D. Thesis
Alexander McMaster 1974 198 p
Avail: Univ. Microfilms Order No. 74-15488

The fatigue behavior of specimens of commercial polystyrene (PS), tested at 2500 psi completely reversed stress amplitude, was studied under the conditions of varying artificial notch flaw size and with and without thin film metal coatings. Fatigue lifetimes were also measured for uncoated polished specimens at varying mean stress levels and a reversed stress amplitude of 2500 psi and for varying mean and alternating stress levels but with a 2500 psi maximum stress. Fracture surfaces of many specimens were examined with the scanning electron miscroscope (SEM) to study morphological features related to crack initiation and growth. It was observed that PS specimens coated with thin films of gold and aluminum, in the thickness range of 665 to 2280 A, had fatigue lifetimes two-fold greater than uncoated PS specimens cycled to failure at 2500 psi completely reversed stress. Dissert. Abstr.

N74-30324 California Inst. of Tech., Pasadena.
FLOW INDUCED VIBRATION OF BLUFF STRUCTURES Ph.D. Thesis
Robert Dilworth Blevins 1974 146 p
Avail: Univ. Microfilms Order No. 74-14263

Models are developed for both multi-degree-of-freedom aerodynamic galloping and vortex induced oscillation of bluff structures. These models are useful in the analysis of elastic structures exposed to a steady fluid flow. An asymptotic method, is developed for the analysis of the autonomous, internally resonant, nonlinear differential equations produced by the models. It is shown that the solutions of these systems can be divided into two classes by the nature of the secular terms arising in the perturbation equations. A model for multi-degree-of-freedom galloping is developed by modeling the aerodynamic forces on the structure as dependent only on the relative magnitude and velocity of the flow to the structure. A simple criterion for the stability of the zero solution is presented. Examples are made with a noninertially coupled system with the torsion and plunge degrees-of-freedom and a cubic curve fit to the aerodynamic coefficients. Dissert. Abstr.

N74-30325 Washington Univ., Seattle.
A PHOTOELASTIC AND NUMERICAL STUDY ON FRACTURE DYNAMICS OF STRESSED PANELS Ph.D. Thesis
Bruce Gordon Wade 1974 348 p
Avail: Univ. Microfilms Order No. 74-15529

The crack arrest capability of a stressed pannel was studied

by comparing experimentally determined dynamic results to corresponding static results. Dynamic photoelasticity was used for the elasto-dynamic portion of the investigation, while the method of finite element analysis was used for determining the elasto-static state of stress. A modified Schardin multiple spark-gap camera was used to provide a photoelastic record of the stress field about a propagating brittle crack. Homalite-100 test specimens were loaded in a fixed-grip configuration with prescribed displacement boundary conditions along the two gripped edges of the 10 by 10-inch specimen. At fracture load, which was accomplished either by slowly extending the plate or by projectile impact in a subcritically loaded panel, the crack propagated from a starter crack and then proceeded through the panel. Several tests were conducted on panels that containing centrally located holes as well as on panels that were stiffened by bonded and pin-joined stringers. Dissert. Abstr.

N74-30326# Technische Hogeschool, Delft (Netherlands).
THE EFFECT OF CYCLIC DEFORMATION ON THE TORSIONAL MODULUS IN THE INTERNAL DAMPING OF PURE COPPER Ph.D. Thesis [DE INVLOED VAN CYCLISCHE DEFORMATIE OP DE TORSIEMODULUS EN DE INWENDIGE DEMPING VAN ZUIVER KOPER]
Rudy DenBuurman 1974 138 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC $10.00

The behavior of the shear modulus (G) and the internal friction, characterized by Q/1, of polycrystalline pure copper during torsional fatigue and subsequent recovery are studied. Experiments were done with a torsional pendulum in vacuum. Fatigue causes a decrease of G and an increase of Q/1 in a manner analogous to that reported for undirectional deformation. These variations can be attributed to dislocation multiplication. The experimental results have been analysed in terms of a vibrating string model, predicting a modulus effect (-delta G/G) and values of Q/1 proportional to delta L sub g to the 2nd power and delta L sub g to the 4th power respectively. Delta represents the dislocation density and L sub g the mean dislocation line length. This analysis yields a reasonable behaviour of delta and L sub g as a function of the number of fatigue cycles. Results are in good agreement with measurements of the flow stress during fatigue. Author

N74-30327# Technischen Universitaet, Hanover (West Germany).
COMPARISON OF MICROGEOMETRIC DIMENSIONS OF GROUND STEEL SURFACES WITH DEMANDS FOR A FUNCTIONAL THERMAL EFFECT Ph.D. Thesis [VERGLEICH MIKROGEOMETRISCHER KENNGROESSEN ABGESPANNTER STAHLOBERFLAECHEN MIT DEN ANFORDERUNGEN DER FUNKTION THERMOWIRKUNG]
Helmut Bley 1973 173 p refs In GERMAN
Avail: NTIS HC $11.75

The effectiveness of solid surface roughness measurements in determining microgeometric surface properties and their effects on thermal conductivity is considered for ground steel surfaces. Statistical evaluation or measurements on cut steel surfaces proves that density distributions of surface coordinates and profile slants are not sufficient to determine heat transfer during contact with a heated surface of higher temperature. It is shown that the heat transfer is dependent on effective surface pressure and surface geoemetry. Transl. by G.G.

N74-30328# Technische Universitaet, Brunswick (West Germany).
CALCULATION ON SHELL FRAMEWORKS WITH CURVED GRID ELEMENTS Ph.D. Thesis [BERECHUNG VON SCHALENTRAGWERKEN MIT GEKRUEMMTEN GITTEROSTELEMENTEN]
Dieter Born 1972 97 p refs In GERMAN
Avail: NTIS HC $8.00

Numerical methods for calculating shell frameworks are compared. It is shown that a grid space analogy curved beam matrix elements provides good topological descriptions for electomechanical shells and their profile determinations.
Transl. by G.G.

N74-30329*# Princeton Univ., N.J. Aeroelastic and Magnetoelastic Lab.
ANALYSIS OF COMPLEX ELASTIC STRUCTURES BY A RAYLEIGH-RITZ COMPONENT MODES METHOD USING LAGRANGE MULTIPLIERS Ph.D. Thesis
Larisse Rosentweig Klein Apr. 1974 284 p refs
(Grant NGL-31-001-146)
(NASA-CR-138942; AMS-1159) Avail: NTIS HC $17.25 CSCL 20K

The free vibrations of elastic structures of arbitrary complexity were analyzed in terms of their component modes. The method was based upon the use of the normal unconstrained modes of the components in a Rayleigh-Ritz analysis. The continuity conditions were enforced by means of Lagrange Multipliers. Examples of the structures considered are: (1) beams with nonuniform properties; (2) airplane structures with high or low aspect ratio lifting surface components; (3) the oblique wing airplane; and (4) plate structures. The method was also applied to the analysis of modal damping of linear elastic structures. Convergence of the method versus the number of modes per component and/or the number of components is discussed and compared to more conventional approaches, ad-hoc methods, and experimental results. Author

N74-30330# Technische Hochschule, Darmstadt (West Germany).
CREEP BUCKLING IN VISCOELASTIC CIRCULAR CYLINDRICAL SHELLS UNDER AXIAL PRESSURE Ph.D. Thesis [KRIECHBEULEN VISKOELASTISCHER KREISZYLINDERSCHALEN UNTER AXIALDRUCK]
1973 91 p refs In GERMAN
Avail: NTIS HC $7.75

The viscoelastic behavior of cylindrical shells with local buckling under loads is analyzed by enlarging the Fluegge-Sobel equations so that numerical solutions are obtained. Experiments on polyethylene foil cylinders confirm theoretical calculations on buckling behavior. Calculations using principles of Donnell's shell theory provide also good results if diameter and length of the cylindrical shell are of the same order. Transl. by G.G.

N74-30331# Technische Hochschule, Darmstadt (West Germany).
APPLICATION OF AN INTEGRAL METHOD FOR CALCULATING ELASTIC PLATES WITH STATIC OR GEOMETRIC BOUNDARY CONDITIONS UNDER THE EFFECTS OF RANDOM EDGE- OR INTERIOR-LOADS [ANWENDUNG EINES INTEGRALVERFAHRENS AUF DIE BERECHNUNG ELASTISCHER SCHEIBEN MIT STATISCHEN ODER GEOMETRISCHEN RANDBEDINGUNGEN UNTER DER EINWIRKUNG BELIEBIGER RAND- ODER INNENLASTEN]
Harald Friemann 1973 107 p refs In GERMAN
Avail: NTIS HC $8.50

An integral method is used to solve elastic plate problems that do not complete the boundary transfer between a real edge and an imaginary edge so that the edge loading affects the infinite plate and can be determined by using line effects. Approximate solutions for the integral equations consider only an infinite shell under load. Partial functions composed of two triangular symmetrical load lines in the infinite shell are developed for the torsion problem. Transl. by G.G.

N74-30332# Cranfield Inst. of Technology (England). College of Aeronautics.
APPLICATION OF THE FOKKER-PLANCK EQUATION TO RANDOM VIBRATION OF NONLINEAR SYSTEMS
Colin L. Kirk Apr. 1974 45 p refs
(Cranfield-Aero-20) Avail: NTIS HC $5.25

The stationary Fokker-Planck equation is applied to the determination of the probability density function of the response of a single-degree-of-freedom system with linear and cubic stiffness terms, subject to Gaussian white noise excitation. The statistical quantities evaluated are: (1) mean square amplitude (2) average rate of level crossing (3) mean value of peaks. A random Palmgren-Miner fatigue analysis reveals that a hardening spring characteristic increases the expected fatigue life. For systems with specific nonlinear damping the equation of motion is reduced to an equivalent nonlinear differential equation for which the exact probability density function can be obtained from the Fokker-Planck equation. Comparison is made with the equivalent linearization method which assumes a Gaussian

response and it is shown that this assumption always over estimates the mean square response. Author

N74-30333*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-TIP-SPEED FIBER COMPOSITE COMPRESSOR BLADES: VIBRATION AND STRENGTH ANALYSIS
C. C. Chamis and J. E. Lynch 24 May 1974 27 p refs Presented at 2d Conf. on Fibrous Composites in Flight Vehicle Design, Dayton, Ohio, 22-24 May 1974; sponsored by AFFDL and AFML
(NASA-TM-X-71589; E-8042) Avail: NTIS HC $3.25 CSCL 20K

An analytical procedure is described which couples composite mechanics computer codes with NASTRAN. This procedure was used to perform a detailed analysis of a high-tip-speed fiber composite compressor fan blade. The results indicate that the various vibration modes of this blade are highly coupled. Mechanical load ply stresses are well below the corresponding room temperature strengths. Lamination residual stresses are likely to cause transply cracks and interply delamination. Transply cracks and relaxation of root fixity decrease the vibrational frequencies whereas centrifugal stiffening increases them. Comparisons of results for various parameters are presented in tabular and graphical form. Author

N74-30334*# Grumman Aerospace Corp., Bethpage, N.Y.
ANALYSIS OF WING-BODY INTERACTION FLUTTER FOR A PRELIMINARY SPACE SHUTTLE DESIGN Final Report
Richard R. Chipman and Peter Shyprykevich Washington NASA Jul. 1974 58 p refs
(Contract NAS1-10635)
(NASA-CR-2429) Avail: NTIS HC $3.75 CSCL 22B

Subsonic flutter analyses for a preliminary space shuttle design were performed to determine the effect of wing-body aerodynamic interaction on the vehicle flutter speed. It was found that the proximity of the large bodies of the shuttle to the wing reduces critical flutter speed by 11%. Aerodynamic reflection off the bodies is the dominant interaction effect while aerodynamic forces caused by body motion are of secondary importance in most cases. The analyses employed a doublet-lattice representation of the space shuttle, where in the wing and body surfaces were modeled by a lattice of nonplanar lifting surface elements. Axial singularities were introduced to account for body incidence, volume, and camber (slender body) effects. A series of studies on the placement and number of these elements was performed to ensure convergence of the results. Author

N74-30335*# Michigan Univ., Ann Arbor. Dept. of Materials and Metallurgical Engineering.
DEFORMATION CHARACTERISTICS AND TIME-DEPENDENT NOTCH SENSITIVITY OF UDIMET 700 AT INTERMEDIATE TEMPERATURES Final Report
David J. Wilson Mar. 1974 81 p refs
(Grant NGL-23-005-005)
(NASA-CR-134613; Rept-043680-20-F) Avail: NTIS HC $7.25 CSCL 20K

Time dependent notch sensitivity was observed in Udimet 700 sheet, bar, and investment castings between 1000 and 1400 F (538 -760 C), but not at 1600 F (871 C). As was the case for modified Waspaloy, Waspaloy and Inconel 718, it occurred in notched specimens loaded below the yield strength when the creep deformation was localized. For each alloy and notched specimen geometry, a stress-average particle size zone can be defined that characterizes the notch sensitive behavior. Author

N74-30336*# Cincinnati Univ., Ohio.
[STRESS TESTS ON CYLINDERS AND ALUMINUM PANELS] Final Report, 1 Aug. 1973 - 31 Jul. 1974
L. H. Sobel and B. L. Agarwal 31 Jul. 1974 125 p refs
(Grant NGR-36-004-065)
(NASA-CR-139215) Avail: NTIS HC $9.25 CSCL 20K

An optimization study of composite stiffened cylinders is discussed. The mathematical model for the buckling has been coupled successfully with the optimization program AESOP. The buckling analysis is based on the use of the smeared theory for the buckling of stiffened orthotropic cylindrical shells. The loading, radius, and length of the cylinder are assumed to be known parameters. An optimum solution gives the value of cross-sectional dimensions and laminate orientations. The different types of buckling modes are identified. Mathematical models are developed to show the relationships of the parameters. Author

N74-30337*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
STRESS INTENSITY FACTORS FOR DEEPCRACKS EMANATING FROM THE CORNER FORMED BY A HOLE INTERSECTING A PLATE SURFACE
J. J. McGowman and C. W. Smith Apr. 1974 28 p refs
(Grant NGR-47-004-076)
(NASA-CR-132484; VPI-E-74-1) Avail: NTIS HC $4.50 CSCL 20K

A technique consisting of freezing photo-elasticity and a numerical method was used to obtain stress intensity factors for natural cracks emanating from the corner at which a hole intersects a plate surface. Geometries studied were: (1) crack depth to thickness ratios of approximately 0.2, (2) 0.5 and 0.75; (3) crack depth to crack length ratios of approximately 1.0 to 2.0; and (4) crack length to hole radius ratios of about 0.5 to 2.0. All final crack geometries were grown under monotonic loading and growth was not self similar, with most of the growth occuring through the thickness under remote extension. Stress intensity factors were determined at the intersection of the flaw border. Author

N74-30338*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ON THERMAL STRESS FAILURE OF THE SNAP-19A RTG HEAT SHIELD
William C. Pitts and Lewis A. Anderson Washington Jul. 1974 12 p refs
(NASA-TM-X-3097; A-5516) Avail: NTIS HC $3.00 CSCL 18J

Results of a study on thermal stress problems in an amorphous graphite heat shield that is part of the launch-abort protect system for the SNAP-19A radio-isotope thermoelectric generators (RTG) that will be used on the Viking Mars Lander are presended. The first result is from a thermal stress analysis of a full-scale RTG heat source that failed to survive a suborbital entry flight test, possibly due to thermal stress failure. It was calculated that the maximum stress in the heat shield was only 50 percent of the ultimate strength of the material. To provide information on the stress failure criterion used for this calculation, some heat shield specimens were fractured under abort entry conditions in a plasma arc facility. It was found that in regions free of stress concentrations the POCO graphite heat shield material did fracture when the local stress reached the ultimate uniaxial stress of the material. Author

N74-30339*# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
APPLICATION OF A SUBSTRUCTURING TECHNIQUE TO THE PROBLEM OF CRACK EXTENSION AND CLOSURE
H. Armen, Jr. Jul. 1974 40 p refs
(Contract NAS1-12198)
(NASA-CR-132458; RE-480) Avail: NTIS HC $5.00 CSCL 20K

A substructuring technique, originally developed for the efficient reanalysis of structures, is incorporated into the methodology associated with the plastic analysis of structures. An existing finite-element computer program that accounts for elastic-plastic material behavior under cyclic loading was modified to account for changing kinematic constraint conditions - crack growth and intermittent contact of crack surfaces in two dimensional regions. Application of the analysis is presented for a problem of a centercrack panel to demonstrate the efficiency and accuracy of the technique. Author

N74-30340# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.
CREEP AND RECOVERY PHENOMENA IN URANIUM-PLUTONIUM OXIDE FUEL
D. Vollath Nov. 1973 120 p refs In GERMAN; ENGLISH summary

(KFK-1884) Avail: AEC Depository Libraries HC $8.00

Creep experiments on uranium-plutonium mixed oxides are described. Besides the stress and temperature dependency of the steady-state creep, a phenomenological explanation of the transient creep behavior is also given. For slightly hypostoichiometric uranium-plutonium dioxide a two-term creep formula is determined. In this formula the two stress exponents are 1 and 4.5. To these stress exponents activation-energy values of 117 and 175 kcal/mol are assigned. With the aid of recovery measurements it is possible to assign to these two terms in the creep formula mechanisms of grain-boundary creep and dislocation climbing. On the basis of the recovery measurements the activation energy of movement of oxygen and uranium ions in uranium dioxide of different stoichiometry is also evaluated.

Author (NSA)

N74-30341# Westinghouse Electric Corp., Pittsburgh, Pa. Nuclear Energy Systems.

COMBINED ANALYTICAL-EXPERIMENTAL FRACTURE STUDY OF THE TWO LEADING THEORIES OF ELASTIC-PLASTIC FRACTURE (J-INTEGRAL AND EQUIVALENT ENERGY)

P. C. Riccardella and J. L. Swedlow Oct. 1973 50 p refs Prepared for ORNL Sponsored by AEC

(Contract ORNL-3196)

(WCAP-8224; HSSTP-TR-33) Avail: NTIS HC $4.50

The ability of a pressure vessel steel to resist fracture constitutes an important factor in ensuring nuclear reactor safety. Fracture mechanics is considered as providing the best general approach to understanding the brittle fracture phenomenon in reactor vessel steels. A comprehensive program to apply the technology of both linear elastic and elastic-plastic fracture mechanics to all foreseeable brittle and ductile failure aspects of heavy-walled nuclear pressure vessels is being developed. One important aspect of this program is the extension of linear elastic fracture mechanics concepts to the realm of elastic-plastic fracture mechanics technology. The application of the two leading theories of elastic-plastic fracture (J-Integral and Equivalent Energy) to a relatively simple test specimen geometry, using a two-dimensional, finite element computer program which is general enough to be applied later to more complex reactor vessel problems is reported. Author (NSA)

N74-30342# Sandia Labs., Albuquerque, N.Mex.

TRANSIENT RESPONSE OF AN ELASTIC PLATE TO LOADS WITH FINITE CHARACTERISTIC DIMENSIONS

F. R. Norwood Dec. 1973 48 p refs

(Contract AT(29-1)-789)

(SLA-73-1113) Avail: NTIS HC $4.50

A recently developed technique is used to obtain solutions for an elastic plate acted upon by loads with finite characteristic dimensions. Exact two-dimensional transform solutions are derived for a plate suddenly loaded on one of its bounding surfaces. The transform solutions for a general load are rearranged into infinite sums representing multiply reflected shear and dilatational waves. The interpretation of the infinite sums is verified by ray tracing. The final expressions are used to deduce the Green's function for the velocity. Numerical results are presented for a step function input. Author (NSA)

N74-30343# Brown Univ., Providence, R.I. Div. of Engineering.

MULTIAXIAL CREEP STUDIES OF 304 STAINLESS STEEL Annual Report

W. N. Findley and R. Mark Nov. 1973 66 p refs Prepared for ORNL Sponsored by AEC

(Contract ORNL-3599)

(EMRL-58; AR-2) Avail: NTIS HC $5.50

Tests in combined tension and torsion, pure tension, and pure torsion, were conducted at elevated temperatures (about 1100 F) for times ranging from 601.1 to 1009.25 h. Additional tests performed after the long-time creep tests are described. Attempts to detect circumferential strains were made. A modified superposition principle for metals was used to obtain an expression describing a creep test involving stress reversals. A formulation involving a strain-hardening assumption was made for the same test, and a comparison of the fit of the experimental data with the two expressions is given. Author (NSA)

N74-30344# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.

ELASTIC AND PLASTIC DEFORMATION OF SOLIDS Annual Progress Report, 1 Feb. 1973 - 31 Jan. 1974

A. L. Ruoff 22 Oct. 1973 9 p refs

(Contract AT(11-1)-3153)

(COO-3153-114) Avail: NTIS HC $3.00

The 0 C freezing point of mercury determination based on the combined length and ultrasonic time pressure gage was completed and published. The transformation pressure obtained is p sub t = 7571.2 plus or minus 1.6 bars. The maximum deviation of the manganin gage from linearity is minus 11.6 plus or minus 0.1 bars at P p sub t over 2. A method of machining meter-long LiF single crystals was developed, and combined length and ultrasonic measurements on such a crystal are underway to determine second-pressure derivatives of elastic moduli and to determine the pressure dependence of the Gruneisen parameter. An apparatus was built to measure the pressure dependence of the yield stress of metals with small yield stress and experiments will commence shortly on potassium at liquid nitrogen temperatures. A pressure vessel was equipped with a furnace for internal heating to high temperature and experiments are underway to carry out hot isostatic compaction of very fine carbide particles under controlled conditions to obtain sintering to theoretical density with little grain growth. Author (NSA)

N74-30345# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STABILITY AND WEIGHT OPTIMIZATION OF REINFORCED SPHERICAL SHELLS UNDER EXTERNAL PRESSURE

A. I. Manevich and M. E. Kaganov 4 Apr. 1974 17 p refs Transl. into ENGLISH from Prikl. Mekh. (USSR), v. 9, no. 1, Jan. 1973 p 20-26

(AF Proj. G101)

(AD-778596; FTD-HT-23-830-74) Avail: NTIS CSCL 20/11

The stability of reinforced spherical bottoms loaded by external pressure was examined. Mathematical models for the stability of a reinforced shell with double curvature are developed. The forces and moments given to the middle of the casings are determined by an analysis of the deformations. A method for obtaining an approximate analytical solution is explained.

Author

N74-30346# Air Force Weapons Lab., Kirtland AFB, N.Mex.

A STUDY OF LOAD-DEFORMATION AND BUCKLING RELATIONSHIPS FOR RETICULATED SHELLS Final Report, 15 Mar. 1973 - 31 Mar. 1974

H. Dean Bartel Apr. 1974 244 p refs

(DNA Proj. NWET-Y99QAXS)

(AD-778756; AFWL-TR-74-87) Avail: NTIS CSCL 13/13

The objectives of this research were to determine the theoretical and experimental load-deformation response and buckling loads of reticulated shells and to study the growth of imperfections in reticulated shell models. Two types of theoretical analyses (elastic material behavior was assumed) of reticulated shells were conducted to predict load-deformation relationships. A split rigidity concept was used in which equivalent membrane and bending thicknesses were calculated. The second technique was a space frame analyses using the NASTRAN computer code. Three spherical reticulated shell models (two brass and one plastic) were fabricated and tested experimentally. Results of the study indicated that the NASTRAN code predicted the deflection patterns well and identified the final buckle locations. (Modified author abstract) GRA

N74-30347# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.

PROCESSING AND BALLISTIC EVALUATION OF DUAL-HARDNESS TITANIUM ARMOR Final Report, Aug. 1972 - Feb. 1974

Roger A. Perkins and Elliott H. Rennhack Apr. 1974 67 p refs

(Contract DAAG46-73-C-0013; DA Proj. 1T0-62105-A-328)

(AD-777809; AMMRC-CTR-74-17) Avail: NTIS CSCL 19/4

A program to demonstrate the potential of dual-hardness titanium alloy armor for defeating small-caliber armor-piercing threats was conducted. The armor consisted of either a Ti-3Si-3Fe-0.5N or a Ti-3Si-2Fe-3Mo-0.75 front-face alloy

diffusion/roll-bonded to a Ti-7Al-2.5Mo back-face alloy. The plates were heat-treated to a hardness level of R sub c 54-59 on the surface of the front face and to R sub c 39-43 on the back face. Screening studies of alloy compositions leading to the selection of the two different front-face alloys are discussed. A materials and process improvement study is described that is designed to improve bond-line strength and overall ballistic performance of the dual-hardness composite. Results of a ballistic evaluation study conducted with 30-cal AP projectiles to determine the effect of variable front-to-rear thickness ratios for areal densities of 6, 8, 10, and 12 lb/sq ft are presented. Performance in ballistic tests is correlated with alloy hardness, composition, structure, thickness ratios and areal densities to assess the overall potential of the dual-hardness titanium armor. (Modified author abstract) GRA

N74-30348# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DYNAMICS OF ELASTIC SNAPPING

V. P. Dergunov and M. A. Koltunov 17 Apr. 1974 18 p refs Transl. into ENGLISH from "Issled. po Teorii Plastin i Obolochek" (USSR), no. 8, 1972 p 351-360

(AD-778514; FTD-HT-23-365-74) Avail: NTIS CSCL 20/11

The dynamics of the snapping process on rod-type models which qualitatively reflect the dynamics of a crack of flat shells was examined. It was assumed that the rods of these models were absolutely rigid with regard to bending and elastic with regard to tension. It was further assumed that there was an absence of friction in the hinges connecting the rods. Solutions to the problem were concentrated on the entire mass of structures of the models at the apex of the arch. Author

N74-30349# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROBLEMS OF THE RELIABILITY THEORY IN MECHANICS OF DEFORMABLE SOLIDS

V. V. Bolotin 9 Apr. 1974 28 p refs Transl. into ENGLISH from the monograph "Mekhanika Sploshnoi Sredy i Rodstvennye Problemy Analiza" 1974 p 63-77

(AD-778945; FTD-MT-24-337-74) Avail: NTIS CSCL 20/11

A numerical procedure is described which makes it possible to analyze the effect of structural, technological, and operational factors on the reliability of a system is developed. The system also makes it possible to determine the service life and to predict the reliability of the system. The central element of the theory is the presentation of the evolution of the system in time as a random process in certain phase space and interpretation of a failure as a random rejection from the permissible region in this space. Author

N74-30350# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

BUCKING AND POSTBUCKLING STUDIES OF MOMENT-LOADED THIN-WALL CYLINDRICAL SHELLS WITH CUTOUTS Interim Report

Cheng-Hwa F. Chiang and Emmett A. Witmer Apr. 1974 89 p refs

(Contract DAAG46-72-C-0212; DA Proj. 1T0-61102-B-33A) (AD-779463; ASRL-TR-171-2; AMMRC-CTR-74-30) Avail: NTIS CSCL 13/13

An experimental study of the prebuckling, incipient buckling, and postbuckling behavior of thin-wall aluminum cylindrical shells with a nominal R/h of 100 and subjected to pure bending is reported. The investigation includes initially-undamaged and cutout-predamaged cylindrical shells. The types of predamage include: (1) a single circular hole (three different diameters were employed) and (2) a single slotted hole of fixed size and aspect ratio but oriented axially (phi = 0 degrees), obliquely (phi = 45 degrees), or circumferentially (phi = 90 degrees). Emphasis is given to studying the load-deflection behavior and the associated buckling patterns in the postbuckling range, for both monotonically-increasing angular deflections of the buckled region and unloading-reloading behavior. Load-deflection characteristics and buckling patterns distinctive to each type of specimen tested are presented for bending rotations extending to about 15-20 degrees. Author

N74-30351# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

FINITE-ELEMENT PREDICTIONS OF TRANSIENT ELASTIC-PLASTIC LARGE DEFLECTIONS OF STIFFENED AND/OR UNSTIFFENED RINGS AND CYLINDRICAL SHELLS Final Report

Richard W.-H. Wu and Emmett A. Witmer Apr. 1974 191 p refs

(Contract DAAG46-72-C-0212; DA Proj. 1T0-61102-B-33A) (AD-779453; ASRL-TR-171-4; AMMRC-CTR-74-31) Avail: NTIS CSCL 20/11

A solution procedure which employs the spatial finite-element method together with the temporal finite-difference method is presented for predicting transient elastic-plastic large-deflection responses of structures. Assume-displacement finite-element formulations have been developed in detail for arbitrarily-curved-beam elements and quadrilateral cylindrical-panel elements; specializations to represent straight-beam and flat-plate elements are included. Emphasis has been given to account for geometric stiffeners as well as variable thickness, multilayer, multi-material construction. With the aid of a breadboard computer program, the procedure has been used to predict the transient elastic-plastic large-deflection responses of impulsively-loaded single-layer, singele-material unstiffened and stiffened rings and cylindrical panels for which high quality experimental data and/or independent predictions exist. The feasibility of developing a combined finite-element and finite-difference procedure to represent spatial quantities in structural analysis has been examined in a preliminary fashion. (Modified author abstract) GRA

N74-30352# Massachusetts Univ., Amherst. Dept. of Civil Engineering.

VIBRATIONS OF THIN PLATES: A NEW APPROACH Scientific Report

I. H. Tai and William A. Nash Dec. 1973 157 p refs

(Grant AF-AFOSR-2340-72; AF Proj. 9782)

(AD-779782; AFOSR-74-0789TR) Avail: NTIS CSCL 20/11

The investigation extends the method of Edge-Functions, previously employed only for elastostatic and electrostatic considerations, to the determination of natural frequencies and associated mode shapes of free vibration of thin elastic plates with a variety of boundary conditions. The Edge-Function technique essentially associates an independent coordinate system with every edge of the plate, and for every edge employs functions (satisfying the governing plate vibration equations) that rapidly decay with increasing distance from the plate boundary. Appropriate superposition of solutions stemming from all edges of the plate leads to an approximate representation of the time-dependent deflection surface. Results obtained by the elastodynamic Edge-Function investigation are shown to be in excellent agreement with existing results for natural frequencies and mode shapes of (a) rectangular plates subject to a wide variety of boundary conditions, including the case of a rectangular cantilever plate, and (b) parallelogram shaped plates with simply supported edges. (Modified author abstract) GRA

N74-30353# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FLEXIBLE PLATES AND MEMBRANES (CHAPTER 18)

A. S. Volmir and I. G. Kildibekov 16 Apr. 1974 28 p refs Transl. into ENGLISH from Prochnost i Ustoichivost-Kolebaniya (USSR), v. 1, 1968 p 597-614

(AD-778799; FTD-HT-23-1006-74) Avail: NTIS CSCL 20/11

Equations are presented for computation of stresses and strains in rectangular flexible plates and membranes and round flexible plates and membranes with axisymmetric flexure. A.L.

N74-30354# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

AN EXPERIMENTAL STUDY ON THE BUCKLING OF THIN SHELLS WITH FLAWS Final Report

R. L. Sandelbeck Feb. 1974 69 p refs

(Contract F44620-69-C-0009; AF Proj. 9782)

(AD-778451; SUDAAR-471; AFOSR-74-0591TR) Avail: NTIS CSCL 20/11

The paper reviews experimental data concerning buckling load dependence upon imperfections in thin circular shells; in

addition, data are presented on several important kinds of defects as yet unreported in the literature. Evidence derived from this and other experimental works has lead the author to submit the possibility that buckling load versus defect amplitude degradation curves do not smoothly descend with increasing defect amplitudes, but rather the curve may be a lower-bound envelope of group of curves, each representing some discrete type of defect not necessarily obvious, but present on the cylindrical shell surface. The paper discusses some major discrepancies that can arise when different test setups and techniques are used.
Author (GRA)

N74-30355# Brown Univ., Providence, R.I. Dept. of Engineering.
THE STRESS INTENSITY FACTOR DUE TO NORMAL IMPACT LOADING OF THE FACES OF A CRACK Summary Report, Jan. - Sep. 1973
L. B. Fremnd Dec. 1973 28 p refs
(Contract F33615-73-C-5089; AF Proj. 7353)
(AD-779674; AFML-TR-73-302) Avail: NTIS CSCL 20/12

The plane strain problem of a half-plane crack in an unbounded elastic solid is considered. The faces of the crack are subjected to suddenly applied, equal but opposite concentrated normal forces which tend to separate the crack faces. The elastic wave propagation problem, which contains a characteristic length, is solved exactly by linear superposition over a fundamental solution arising from a particular problem in the dynamic theory of elastic dislocations. Attention is focused on the time-dependent stress intensity factor. For an applied load with step function time dependence, the stress intensity factor is negative from the time the first wave arrives at the crack tip until the arrival of the Rayleigh wave. At that instant, it takes on its appropriate static value, which is thereafter maintained. Generalizations are discussed for spatially distributed and/or time-varying normal impact loads.
Author (GRA)

N74-30356# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPERIMENTAL RESEARCH ON THE STABILITY SLANTING CONICAL PANELS UNDER EXTERNAL UNIFORM PRESSURE
V. G. Vybornov and N. P. Velikanova 10 Apr. 1974 14 p refs Transl. into ENGLISH from Issled. Teorii Plastin Obolochek (USSR), v. 9, 1972 p 219-228
(AD-779208; FTD-HT-23-346-74) Avail: NTIS CSCL 20/11

The problem of the stability of conical panels which are under external uniform pressure is discussed. Slanting conical panels whose outline is bounded by two arcs of the directrix of the conical shell and two helical lines which intersect the generatrices of the cone at the angle of beta are investigated.
Author (GRA)

N74-30357# Brown Univ., Providence, R.I. Dept. of Engineering.
BOUNDS FOR FINITE DEFLECTIONS OF IMPULSIVELY LOADED STRUCTURES WITH TIME-DEPENDENT PLASTIC BEHAVIOR
P. S. Symonds and C. T. Chon Dec. 1973 40 p refs
(Contract N00014-67-A-0191-0003)
(AD-779049; TR-22) Avail: NTIS CSCL 20/11

The paper shows that upper bounds on deflections of an impulsively loaded structure whose behavior in the plastic range is strain rate dependent may be obtained by an application of the theorem of minimum potential energy, with results valid for finite deflections and strains. The concepts of extremal path behavior in strain-time space, due to Ponter, are used in order to provide unique definitions of strain energy and complementary energy for the path dependent material. The theorems are illustrated by examples of fully constrained beams in which deflections of the order of the beam thickness lead to large forces of membrane type.
Author (GRA)

N74-30358# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LARGE BENDING DEFLECTIONS AND THE STABILITY OF A LONG, MILDLY SLOPING, ORTHOTROPIC CYLINDRICAL PANEL UNDER THE EFFECT OF LOCAL LOAD
M. S. Ganeeva and M. S. Kornishin 10 Apr. 1974 14 p refs Transl. into ENGLISH from Issled. po Teorii Plastin i Obolochek (USSR), no. 9, 1972 p 283
(AD-779202; FTD-HT-23-351-74) Avail: NTIS CSCL 20/11

A numerical analysis of the cylindrical bending of a long, mildly sloping, orthotorpic circular panel under the effect of a load uniformly distributed along a line parallel to the long sides is presented. The results are compared with the solution obtained on the basis of the Kirchoff hypothesis. Curves are developed to show that: (1) the effect of shear during asymmetric application of load upon maximum bending deflections is approximately the same as that for the symmetric application of the load and (2) the extremal point for hinged fixing characteristics under conditions of asymmetric loads is significant, but is smaller than in the case of symmetric application.
Author

N74-30359# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
EXPERIMENTAL TRANSIENT AND PERMANENT DEFORMATION STUDIES OF IMPULSIVELY-LOADED RINGS AND CYLINDRICAL PANELS, BOTH STIFFENED AND UNSTIFFENED Interim Report
Emmett A. Witmer, Richard W.-H. Wu, and Fred Merlis Apr. 1974 116 p refs
(Contract DAAG46-72-C-0212; DA Proj. 1T0-61102-B-33A)
(AD-779485; ASRL-TR-171-3; AMMRC-CTR-74-29) Avail: NTIS CSCL 20/11

The sheet high-explosive loading technique was employed to conduct impulsive loading and structural response studies of (a) unstiffened and stiffened freely-suspended initially-circular rings of 6061-T6511 aluminum alloy and of (b) unstiffened and circumferentially-stiffened cylindrical panels of 6061-T6 aluminum alloy with all four edges ideally clamped. These specimens have well-defined geometric properties, material properties, and boundary conditions. Impulse calibration tests for the Detasheet D explosive employed provide impulse loading information and small uncertainty. Large transient and permanent deformations were produced. The measured transient and permanent strains as well as the permanent deformation data obtained are believed to provide reliable and definitive data which the analyst may use to evaluate the accuracy and reliability of pertinent structural computer codes for predicting large-deformation, elastic-plastic structural responses of transiently-loaded structures. Only experimental data are presented in this report.
Author (GRA)

N74-30360# Washington Univ., Seattle. Dept. of Mechanical Engineering.
STRESS INTENSITY FACTORS FOR ELLIPTICAL CRACKS Interim Technical Report
Albert S. Kobayashi, A. N. Enetanya, and R. C. Shah Mar. 1974 22 p refs
(Grant DA-ARO(D)-31-124-73-G38)
(AD-779469; AROD-10100-2-E; TR-2) Avail: NTIS CSCL 20/11

The combined use of a solution for an elliptical crack subjected to a polynomial distribution of internal pressure together with a free surface solution for the alternating method is reviewed in order to improve the efficiency of this numerical technique. Numerical differentiation to avoid deriving and computer programming of complex mathematical expressions is discussed. A criterion for maximum grid size for the free surface solution is proposed. Also optimum fittings of the first, second and third order polynomial distributions of internal pressure are considered.
Author (GRA)

N74-30361# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
BUCKLING OF CYLINDRICAL SHELLS HEATED ALONG TWO OPPOSITE GENERATORS COMBINED WITH AXIAL COMPRESSION
Yoseph Frum and Menahem Baruch Dec. 1973 71 p refs
(Grant AF-AFOSR-2394-72; AF Proj. 9782)
(AD-779785; TAE-180; AFOSR-74-0791TR) Avail: NTIS CSCL 20/11

The present work represents a series of tests carried out on clamped cylindrical shells under a combination of thermal and mechanical loads. The shells were linearly heated along two opposite generators in addition to a uniform axial pressure applied before the heating. The work describes the test set up,

equipment and techniques used. These techniques are applicable to a wide range of similar problems. Systems for rapid measurement, data analysis and storage designed for the experimental work are presented. Also presented are several improvements introduced in the course of the test in order to overcome experimental difficulties. Among these, the most complicated one was the requirement of compliance with restraint conditions throughout the heating period. As an outcome of this study a linear interaction-line is proposed in order to express the interaction between thermal and mechanical buckling loads. Author (GRA)

N74-30362# Wisconsin Univ., Madison. Mathematics Research Center.
A STATIC PROBLEM OF EXTERNAL CRACKS Technical Summary Report
R. P. Srivastav Apr. 1974 23 p refs
(Contract DA-31-124-ARO(D)-462)
(AD-779441; MRC-TSR-1439) Avail: NTIS CSCL 20/11

Of concern here is the distribution of stress in an isotropic elastic medium containing two external cracks. The two-dimensional plane-strain model in the classical theory of elasticity is considered. The boundary value problem is reduced to a pair of dual integral equations with trigonometric kernels. Closed form expressions are obtained for (a) the stress intensity factor, (b) the normal component of stress on the line of crack and (c) the crack profile. Author (GRA)

N74-30363# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
VIBRATIONS OF AXIALLY LOADED STIFFENED CYLINDRICAL SHELLS. PART 2: EXPERIMENTAL ANALYSIS
Aviv Rosen and Josef Singer Aug. 1973 116 p refs
(Grant AF-AFOSR-2394-72; AF Proj. 9782; AF Proj. 6813)
(AD-778922; TAE-163-Pt-2; AFOSR-74-0684TR) Avail: NTIS CSCL 20/11

To complement a parallel theoretical analysis experiments were conducted on seven different clamped cylindrical aluminum shells: one isotropic shell, four shells stiffened by external stringers, and two strengthened by external rings. In all the experiments smooth experimental curves of frequency versus axial load were obtained for different modes of vibration. The agreement between the experimental and the corresponding theoretical curves is good, but in most of the cases the experimental frequencies were slightly lower than the theoretical ones. As in previous experiments, experimental buckling loads were lower than the calculated ones. A possibility of nondestructive determination of the buckling load, by means of vibrations measurements was considered. (Modified author abstract) GRA

N74-29800* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE REACTIONS OF SKIN PANELS IN RELATION TO DURATION OF ACOUSTICAL LOADING
V. Ye. Kvitka and G. I. Kernes *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 41-43 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 39-41 (For availability see N74-29785 19-15)
CSCL 20K

N74-29802* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATIONS IN ELECTRIC POWER TRANSMISSION LINES
I. I. Vitkus, T. P. Matekonis, and K. M. Ragulskis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 48-49 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 46-47 (For availability see N74-29785 19-15)
CSCL 20K

N74-29803* Kanner (Leo) Associates, Redwood City, Calif.
ANALYTIC DESCRIPTION OF VIBRATIONS IN A PIPING SYSTEM WITH PULSATING FLOW
G. P. Bosnyatskiy, R. I. Grossman, A. A. Kozobkov, and A. I. Koppel *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 51-52 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 49-50 (For availability see N74-29785 19-15)
CSCL 20K

N74-29804* Kanner (Leo) Associates, Redwood City, Calif.
THE USE OF A DIGITAL COMPUTER FOR CALCULATION OF ACOUSTIC FIELDS OF COMPLEX VIBRATING STRUCTURES BY THE RECIPROCITY PRINCIPLE
A. V. Rimskiy-Korsakov and Yu. I. Belousov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 53-56 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 51-53 (For availability see N74-29785 19-15)
CSCL 20K

N74-29805* Kanner (Leo) Associates, Redwood City, Calif.
STATISTICAL PARAMETERS OF REVERBERATING FIELDS, CALCULATED BY COMPUTER
I. V. Lebedeva and L. G. Rubanova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 57-60 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 54-56 (For availability see N74-29785 19-15)
CSCL 20K

N74-29806* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL ESTIMATION OF THE STATISTICAL PARAMETERS OF VIBRATIONS OF A SHELL (USING A DIGITAL COMPUTER), 1
B. A. Kanayev, G. S. Lyubashevskiy, and B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 61-67 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 57-63 (For availability see N74-29785 19-15)
CSCL 20K

N74-29807* Kanner (Leo) Associates, Redwood City, Calif.
EXPERIMENTAL ESTIMATION OF THE STATISTICAL PARAMETERS OF VIBRATIONS OF A SHELL (USING A DIGITAL COMPUTER), 2
B. A. Kanayev, G. S. Lyubashevskiy, and B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 68-73 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 64-69 (For availability see N74-29785 19-15)
CSCL 20K

N74-29808* Kanner (Leo) Associates, Redwood City, Calif.
A MATHEMATICAL MODELING METHOD FOR DETERMINATION OF LOCAL VIBROACOUSTIC CHARACTERISTICS OF STRUCTURES
B. D. Tartakovskiy and A. B. Dubner *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 74-77 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 70-72 (For availability see N74-29785 19-15)
CSCL 20K

N74-29809* Kanner (Leo) Associates, Redwood City, Calif.
OPTIMIZATION OF PARAMETERS OF THREE-LAYER VIBRATION-ABSORBING STRUCTURES USING A DIGITAL COMPUTER
T. M. Avilova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 78-80 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 73-75 (For availability see N74-29785 19-15)
CSCL 20K

N74-29810* Kanner (Leo) Associates, Redwood City, Calif.
AUTOMATION OF MEASUREMENT OF SPATIAL DAMPING PARAMETERS
A. N. Akolzin, A. I. Vyalyshev, B. D. Tartakovskiy, and T. I. Shmeleva *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 81-82 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 76-77 (For availability see N74-29785 19-15)
CSCL 20K

N74-29813* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF VIBRATION CHARACTERISTICS OF THIN PLATES COVERED WITH A THIN VISCOUS LAYER
A. K. Damashyavichyus, I. Sh. Rakhmatulin, V. K. Naynis, and Yu. K. Konenkov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 89-90 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 84 (For availability see N74-29785 19-15)
CSCL 20K

N74-29816* Kanner (Leo) Associates, Redwood City, Calif.
DIAGNOSTICS OF LOAD VIBRATIONS AT THE INLET OF A MECHANISM
V. P. Dontsu, Z. T. Dontsu, K. M. Ragulskis, and N. M. Savka *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 103-104 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 97-98 (For availability see N74-29785 19-15)
CSCL 20K

N74-29817* Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF VIBRATIONS OF WORKING ELEMENTS OF A TWO COORDINATE SCANNER
K. L. Kumpikas *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 105-106 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 99-100 (For availability see N74-29785 19-15)
CSCL 20K

N74-29819* Kanner (Leo) Associates, Redwood City, Calif.
COMPUTER DIAGNOSTICS OF SHOCK PROCESSES
A.-A. P. Laurutis and B. V. Rudalvis *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 110-114 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticceskim Protsessam" Kaunas, KPI Press, 1972 p 104-108 (For availability see N74-29785 19-15)
CSCL 20K

N74-29826* Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION OF AN OBJECT BY INPUT AND OUTPUT SPECTRAL CHARACTERISTICS
S. F. Redko and V. F. Ushkalov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 139-141 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 127-128 (For availability see N74-29785 19-15)
CSCL 20K

N74-29831* Kanner (Leo) Associates, Redwood City, Calif.
USE OF THE DISPERSION RATIO IN ESTIMATING THE NONLINEAR PROPERTIES OF AN OBJECT OF DIAGNOSIS
F. Ya. Balitskiy, M. D. Genkin, M. A. Ivanova, A. A. Kobrinskiy, and A. G. Sokolova *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 157-159 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 142-143 (For availability see N74-29785 19-15)
CSCL 20K

N74-29838* Kanner (Leo) Associates, Redwood City, Calif.
STRUCTURAL ANALYSIS OF VIBROACOUSTICAL PROCESSES
A. P. Gromov, L. L. Myasnikov, Ye. N. Myasnikova, and B. A. Finagin *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 179-180 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 160-161 (For availability see N74-29785 19-15)
CSCL 20K

N74-29846* Kanner (Leo) Associates, Redwood City, Calif.
THE RELATIONSHIP OF TRANSIENT VIBRATIONAL PROCESSES AT A POINT IN A PLATE TO THE NATURE OF SUDDEN KINEMATIC DISTURBANCES
Yu. K. Konenkov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 204-207 Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 180-182 (For availability see N74-29785 19-15)
CSCL 20K

N74-29849* Kanner (Leo) Associates, Redwood City, Calif.
ACTIVE DAMPING OF UNIDIMENSIONAL STRUCTURES
B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 216-221 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 190-195 (For availability see N74-29785 19-15)
CSCL 20K

N74-29850* Kanner (Leo) Associates, Redwood City, Calif.
COMPENSATION OF VIBRATIONS OF A UNIDIMENSIONAL STRUCTURE AND A PLANE ACOUSTICAL FIELD
B. D. Tartakovskiy *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 222-228 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 197-201 (For availability see N74-29785 19-15)
CSCL 20K

N74-29857* Kanner (Leo) Associates, Redwood City, Calif.
TRANSITIONAL MODES OF MOTION AND CAPTURE REGIONS OF VIBROSHOCK SYSTEMS
V. L. Ragulskene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 250-255 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 222-228 (For availability see N74-29785 19-15)
CSCL 20K

N74-29858* Kanner (Leo) Associates, Redwood City, Calif.
CERTAIN CHARACTERISTICS AND CAPTURE REGIONS OF NONLINEAR VIBRATING SYSTEMS
V. L. Ragulskene *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 256-259 refs Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 229-231 (For availability see N74-29785 19-15)
CSCL 20K

N74-29863* Kanner (Leo) Associates, Redwood City, Calif.
SPECTRAL COMPOSITION OF A MEASURING SIGNAL DURING MEASUREMENTS OF VIBRATION RATES OF A MOVING BODY
I.-A. I. Daynauskas and N. N. Slepov *In its* Cybernetic Diagnostics of Mech. Systems with Vibro-acoustic Phenomena (NASA-TT-F-14899) Jun. 1973 p 275-278 ref Transl. into ENGLISH from the book "Kiberneticheskaya Diagnostika Mekhanicheskikh

Sistem po Vibroakusticheskim Protsessam" Kaunas, KPI Press, 1972 p 246-249 (For availability see N74-29785 19-15) CSCL 20K

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-30364# Cranfield Inst. of Technology (England).
CALCULATED ADIABATIC COMBUSTION TEMPERATURES OF HYDROCARBON-AIR MIXTURES
E. M. Goodger [1974] 28 p refs
(Cranfield-SME-6) Avail: NTIS HC $4.50

Manually calculated values of adiabatic combustion temperature are presented, using a slightly modified version of Penner's method, for the simple cases of nondissociation, and of dissociation to CO, H2 and O2 only, for a wide range of gaseous-phase hydrocarbon compounds in stoichiometric admixture with air. The variations in combustion temperature with carbon number are found to match most closely those of the reaction enthalpy plotted on a basis of unit mass of stoichiometric mixture. Non dissociated and dissociated stoichiometric temperatures are found to average out approximately to 2460 K and 2340 K respectively. The effects of variations in mixture strength, initial reactant temperature, and reaction pressure are also investigated. Author

N74-30365# Technische Hogeschool, Delft (Netherlands).
SOME ASPECTS OF THERMOMETRY AND HEAT TRANSFER BELOW 0.3K Ph.D. Thesis
Carlo Beduz 1973 116 p refs
Avail: NTIS HC $9.00

Aspects of physical research below 0.1 K were investigated. Experiments are presented on carbon thermometry, cerium magnesium nitrate (CMN) powder thermometry, boundary resistances and relaxation times. The main purpose was to extend the temperature range in which carbon resistors can be reliably calibrated into the milikelvin region. Author

N74-30366# National Aerospace Lab., Tokyo (Japan).
GAS-PHASE IGNITION OF HYPERGOLIC PROPELLANT SYSTEMS AT REDUCED PRESSURES
Hiroshi Miyajima, Akio Suzuki, and Hiroshi Sakamoto 1973 15 p refs In JAPANESE; ENGLISH summary
(NAL-TR-352) Avail: NTIS HC $4.00

A method of measuring an ignition delay of gasified hypergolic propellants in a quasi-steady flow at low pressure conditions is described. The propellant systems utilized were N2O4-UDMH and N2O4-N2H4. The effects of flow parameters on the ignition delay were within the range of experiments, and the ignition delay is considered to be controlled primarily by chemical kinetic factors. Empirical equations of ignition delay as a function of temperature and pressure were obtained. Author

N74-30367*# National Aeronautics and Space Administration, Washington, D.C.
HEAT TRANSFER AND THERMODYNAMICS: A COMPILATION Technology Utilization
[1974] 30 p
(NASA-SP-5959(01)) Avail: NTIS HC $1.00 CSCL 20M

A compilation is presented for the dissemination of information on technological developments which have potential utility outside the aerospace and nuclear communities. Studies include theories and mechanical considerations in the transfer of heat and the thermodynamic properties of matter and the causes and effects of certain interactions. M.C.F.

N74-30368*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDIES OF HEAT SOURCE DRIVEN NATURAL CONVECTION
F. A. Kulacki, M. E. Nagle, and Patrick Cassen Jul. 1974 74 p refs Prepared by Ohio State Univ. Res. Found.
(Grant NGR-36-008-205; RF Proj. 3746)
(NASA-TM-X-70232; TR-3746-1) Avail: NTIS HC $6.75 CSCL 20M

Natural convection energy transport in a horizontal layer of internally heated fluid with a zero heat flux lower boundary, and an isothermal upper boundary, has been studied. Quantitative information on the time-mean temperature distribution and the fluctuating component of temperature about the mean temperature in steady turbulent convection are obtained from a small thermocouple inserted into the layer through the upper bounding plate. Data are also presented on the development of temperature at several vertical positions when the layer is subject to both a sudden increase and to a sudden decrease in power input. For changes of power input from zero to a value corresponding to a Rayleigh number much greater than the critical linear stability theory value, a slight hysteresis in temperature profiles near the upper boundary is observed between the heat-up and cool-down modes. Author

N74-30369*# Tulsa Univ., Okla. Dept. of Mechanical Engineering.
ENERGY TRANSFER IN VOLUME-REFLECTING HEAT SHIELDS Semiannual Status Report, Jan. - Jun. 1974
Kenneth C. Weston Jun. 1974 19 p refs
(Grant NGR-37-008-003)
(NASA-CR-139407) Avail: NTIS HC $4.00 CSCL 20M

An approximate analytic solution is provided for the unsteady radiative heating of a highly scattering medium under constant heat flux boundary conditions. The accuracy of the method in representing the reflectance, radiative flux, and radiative flux divergence of the materials was also explored, as was the influence of anistropic scattering on these parameters. Author

N74-30370# Commission of the European Communities, Luxembourg.
CODE TAFEST: NUMERICAL SOLUTION TO TRANSIENT HEAT-CONDUCTION PROBLEMS USING FINITE ELEMENTS IN SPACE AND TIME
J. Donea and S. Giuliani 1974 41 p refs
(EUR-5049) Avail: AEC Depository Libraries HC $4.25

The computer code TAFEST that has been developed for the purpose of solving two-dimensional transient heat-conduction problems is described. The concept of finite elements in space and time is used as a means of obtaining numerical responses. Author (NSA)

N74-30371# Naval Weapons Center, China Lake, Calif.
ALUMINUM DROPLET COMBUSTION: RATES AND MECHANISMS IN WET AND DRY OXIDIZERS Summary Report, 1 May 1973 - 30 Apr. 1974
Jack L. Prentice Apr. 1974 36 p refs
(UF31323303)
(AD-778037; NWC-TP-5569) Avail: NTIS CSCL 21/2

The report describes quantitative single aluminum droplet combustion studies in a variety of gaseous oxidizers including CO2 and water vapor. A laser ignition technique was employed which has a demonstrated ability to yield metal droplet burning data of very low scatter. A discussion of droplet burning models is included and the faulty assumptions underpinning them are identified. Based on experimental findings, an outline is given of the direction modeling must take to accurately describe Al droplet combustion. (Modified author abstract) GRA

N74-30372# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
DEVELOPMENT OF HEAT PIPE COOLED ANODE FOR XENON ARC LAMP Final Technical Report, Jan. 1973 - Jan. 1974
LLoyd A. Nelson Mar. 1974 64 p
(Contract DAAK02-73-C-0113; DA Proj. 1F6-62701-D-466)
(AD-777505; FR-74-10-223) Avail: NTIS CSCL 13/10

A heat pipe cooled anode for a 10 KW xenon lamp has been designed, fabricated and tested. The heat pipe was designed to operate at 700C and transfer 4 KW from the anode tip to ambient air. The heat pipe cooled anode was designed to be integrated into a 10 KW lamp and give normal arc characteristics. The heat pipe anode was fabricated, processed and tested. The

heat pipe anode operated successfully, demonstrating the feasibility of heat pipe cooling of lamp anodes, although some problems were encountered and the heat pipe did not reach full design power. Author (GRA)

N74-30373# Aerospace Corp., El Segundo, Calif.
A NOTE ON THE MULTI-ALPHA SOLUTIONS OF THE UPPER BOUNDING PROBLEM FOR THERMAL CONVECTION Technical Report, Jun. - Sep. 1973
25 Feb. 1974 19 p refs
(Contract F04701-73-C-0074)
(AD-776044; TR-0074(4260-10)-8; SAMSO-TR-74-45) Avail: NTIS CSCL 20/13

The transition to multi-alpha solutions of the upper bounding problem for thermal convection is discussed. For convection in a fluid contained between parallel stress-free perfectly conducting boundaries, the single-alpha solutions of Straus (1973) are used to determine the Rayleigh number at which the first transition occurs. Two upper bounding problems are treated: one valid for all values of the Prandtl number and one valid only for large Prandtl numbers. A significant difference between the two problems is noted, the latter allowing no transition to multi-alpha solutions, while the former has a transition at R approximatey 28200. Author (GRA)

N74-30374# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AFTERBURNING OF HIGH TEMPERATURE PRODUCTS OF INCOMPLETE COMBUSTION IN A SUPERSONIC FLOW UPON A SECONDARY INJECTION OF OXIDIZER
Z. G. Shaikhutdinov, A. M. Rusak, V. M. Klevanskii, I. S. Saburov, and L. F. Shaikhinurova 17 Apr. 1974 16 p Transl. into ENGLISH from Inzh. Fiz. Zh., Akad. Nauk Belorussk. SSR (Minsk) v. 25, no. 2, Aug. 1973 p 197-203
(AD-779623; FTD-HT-23-916-74) Avail: NTIS CSCL 21/2

The article is an examination of the results of an experimental study in the afterburning of a supersonic flow of products that have not completely burned on account of re-injected oxidizers HNO3 and N2O4. GRA

N74-30375# United Aircraft Corp., East Hartford, Conn.
A STUDY OF COMBUSTOR FLOW COMPUTATIONS AND COMPARISON WITH EXPERIMENT Final Report
R. F. Anasoulis and H. McDonald Dec. 1973 97 p refs
(Contract EPA-68-02-0267)
(PB-230008/5; EPA-650/2-73-045) Avail: NTIS HC $8.00 CSCL 21B

The report presents a computational procedure for calculating the coupled flow and chemistry within combustion devices. The procedure solves the time-averaging Navier-Stokes equations with coupled chemistry, including the effects of turbulence and radiative hear transfer, using a novel field relaxation method. Although the procedure employs a relatively simple turbulence model, the model can be easily modified within the framework of the computational method. The flow and chemistry within a representative furnace have been computed, using the procedure; and the computations are presented and compared with experimental data. Author (GRA)

N74-30376# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DISPERSION OF COMBUSTION PRODUCTS OF A MECHANICAL MIXTURE OF ALUMINUM AND CADMIUM POWDERS
M. N. Chesnokov and L. V. Goreva 9 Apr. 1974 8 p refs Transl. into ENGLISH from Fiz. Aerodispersnykh Sistem (USSR), no. 6, 1972 p 78-81
(FTD Proj. T74-04-05; FTD Proj. T74-04-06)
(AD-779126; FTD-HT-23-1216-74) Avail: NTIS CSCL 21/2

The influence of cadmium on alumina dispersity was considered. Small cylinders were pressed from well mixed powders of aluminum, cadmium, and ammonium perchloride and burned under normal pressure. The experiment showed the following results for the completeness of aluminum conversion: (1) the addition of cadmium affects the formation and degree of dispersion of alumium oxide; (2) differing degrees of effect occur for each percentage addition of cadmium between 1% and 15%; and (3) the addition of 10% cadmium has the greatest effect. A.A.D.

N74-30377# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A QUESTION OF GAS MOTION NEAR STRONGLY HEATED BODIES
V. N. Zhigulev 10 Apr. 1974 9 p refs Transl. into ENGLISH from Zh. Prikl. Mekh. Tekh. Fiz. (Moscow), no. 4, 1972 p 95-98
(AD-778540; FTD-HT-23-1338-74) Avail: NTIS CSCL 20/13

The general characteristics for the motion of a body in an unevenly heated gas are considered. Thermal slipping and the radiometric effect are discussed for both an unevenly heated body, and an evenly heated body surrounded by a gas with different temperatures. F.O.S.

N74-29890* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB EXPERIMENT M479 ZERO GRAVITY FLAMMABILITY
J. H. Kimzey *In its* Proc. of the 3d Space Processing Symp. on Skylab Results, Vol. 1 Jun. 1974 p 115-130 ref (For availability see N74-29885 19-15)
CSCL 21B

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-30378*+ National Aeronautics and Space Administration, Washington, D.C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, MAY 1974
May 1974 78 p refs
(NASA-SP-7043(01)) Avail: NTIS HC $4.00 CSCL 10A

A bibliography on energy is reported, the bibliography, Energy: A Continuing Bibliography With Indexes, contains 232 reports, journal articles, and other documents originally announced in STAR, and IAA between Jan. 1, and Mar. 31, 1974. The coverage includes regional, national and international energy systems; research and development of fuels and other sources of energy, and energy conversion, transport, transmission, distribution and storage, with special emphasis on use of hydrogen and of solar energy. Also included are methods of locating or using new energy resources. Of special interest is energy for heating, lighting, for powering aircraft, surface vehicles, or other machinery. Author

N74-30379*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MANAGEMENT INFORMATION SYSTEM MODEL FOR PROGRAM MANAGEMENT Ph.D. Thesis - Oklahoma State Univ.
David Leon Shipman 28 Jul. 1972 85 p refs
(NASA-TM-X-70230) Avail: NTIS HC $7.25 CSCL 05B

The development of a model to simulate the information system of a program management type of organization is reported. The model statistically determines the following parameters: type of messages, destinations, delivery durations, type processing, processing durations, communication channels, outgoing messages, and priorites. The total management information system of the program management organization is considered, including formal and informal information flows and both facilities and equipment. The model is written in General Purpose System Simulation 2 computer programming language for use on the Univac 1108, Executive 8 computer. The model is simulated on a daily basis and collects queue and resource utilization statistics for each decision point. The statistics are then used by management to evaluate proposed resource allocations, to evaluate proposed changes to the system, and to identify potential problem areas. The model employs both empirical and theoretical distributions which are adjusted to simulate the information flow being studied. Author

N74-30380# Joint Publications Research Service, Arlington, Va.
SCIENTIFIC STUDIES IN SPACE: SOME RESULTS, PROBLEMS, AND PROSPECTS
R. Z. Sagdeyev and Yu. I. Zaytsev 23 Jul. 1974 22 p Transl. into ENGLISH from Priroda (Moscow), no. 5, May 1974
(JPRS-62550) Avail: NTIS HC $4.25

A review of some results, problems, and prospects of scientific studies in space is presented. Author

N74-30381*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
AUTOMATED FIREARMS IDENTIFICATION SYSTEM (AFIDS), PHASE 1
R. J. Blackwell and E. P. Framan 1 Jul. 1974 28 p refs
(Contract NAS7-100)
(NASA-CR-139371; JPL-SP-43-8) Avail: NTIS HC $4.50 CSCL 05A

Items critical to the future development of an automated firearms identification system (AFIDS) have been examined, with the following specific results: (1) Types of objective data, that can be utilized to help establish a more factual basis for determining identity and nonidentity between pairs of fired bullets, have been identified. (2) A simulation study has indicated that randomly produced lines, similar in nature to the individual striations on a fired bullet, can be modeled and that random sequences, when compared to each other, have predictable relationships. (3) A schematic diagram of the general concept for AFIDS has been developed and individual elements of this system have been briefly tested for feasibility. Future implementation of such a proposed system will depend on such factors as speed, utility, projected total cost and user requirements for growth. The success of the proposed system, when operational, would depend heavily on existing firearms examiners. Author

N74-30382# Committee on Armed Services (U. S. House).
NAVAL PETROLEUM RESERVES
Washington GPO 1973 156 p refs Hearings under authority of H. Res. 185 before Comm. on Armed Serv., 93d Congr., 1st Sess., 17-18 Oct. 1973
(GPO-23-617) Avail: Armed Serv. Investigating Subcomm.

A Congressional investigation was conducted to determine the status of the petroleum resources at the Elk Hills Naval Reserve in California. The area is government owned property and is one of four such government owned oil fields. The statutes protecting the areas are discussed. The manner in which the resources of the oil field are obtained and processed are reported. The overall energy system and the contributions which can be expected from oil reserves are analyzed by selected witnesses. P.N.F.

N74-30383# Committee on Armed Services (U. S. House).
NAVAL PETROLEUM RESERVES
Washington GPO 13 Nov. 1973 14 p refs Rept. under authority of H. Res. 185 presented to Comm. on Armed Serv., 93d Congr., 1st Sess., 13 Nov. 1973
(GPO-24-028) Avail: SOD HC $0.25
For abstract, See N74-30382.

N74-30384# Federal Power Commission, Washington, D.C.
GUIDELINES FOR ENERGY CONSERVATION FOR IMMEDIATE IMPLEMENTATION; SMALL BUSINESS AND LIGHT INDUSTRIES
Feb. 1974 25 p
(FPC/OCE/1) Avail: NTIS HC $4.25

Short term measures to improve the efficiency of fuel utilization by small business concerns and light industry are recommended for particular use during the energy crisis of the Winter of 1974. A course of action is considered that implements the following: (1) control of plant space heating; (2) maintenance and adjustment of combustion equipment; (3) adoption of effective process controls; and (4) modification and upgrading of existing equipment. Detailed guidelines are presented which contain information on the specific item to be improved or modified, how energy conservation for that item is attained, how long it will take to implement the measure, and the estimated energy savings involved. A list of professional resources is included to aid management in finding qualified assistance for initiating their own effective energy conservation program. A.A.D.

N74-30385# National Transportation Safety Board, Washington, D.C.
THE SAFETY BOARD Annual Report, 1973
1973 97 p
Avail: SOD HC $1.10

Both air and surface safety factors are considered by the National Transportation Safety Board of the Department of Transportation in their 1973 annual report to Congress. An outline is presented of important safety recommendations advanced by the board in 1973 along with a summary of DOT accident investigation procedures and precedents. Safety problems are discussed in terms of statistics and accident reports, and major findings are reported for several precentable highway and air crashes that occurred during the year. Early estimation of fatality tolls is discussed along with results from public hearings and special studies on safety management. The FAA delegation of aircraft certification responsibility and the Highway Safety Act of 1973 are described along with excerpts of comments concerning proposed safety legislation. Specific recommendations for aviation highway, railroad, and pipeline safety management are presented in capsule accounts of the accidents which prompted their formulation. A.A.D.

N74-30386# Committee on Finance (U. S. Senate).
ENERGY WINDFALL PROFITS
Washington GPO 1974 131 p Hearings on Section 110 of S. 2589 before Comm. on Finance, 93d Congr., 2d Sess., 22-23 Jan. 1974
(GPO-28-102) Avail: Comm. on Finance

Testimony relevant to Congressional considerations of a proposal to tax excess or windfall profits in the energy sector is presented. The problems of administration of such a bill, including development of regulations, rulings, and litigation guidelines, are discussed. Corporate management procedures with respect to compliance with the proposed bill are also considered. A definition of income subject to windfall profits tax is submitted, and general debate includes a discussion of Internal Revenue Service precedents, the probable impact on gasoline and fuel allocations, and the world oil supplies issue. The possibility that a profits tax would discourage domestic energy production is also discussed. A.A.D.

N74-30387# Committee on Science and Astronautics (U. S. House).
BRIEFING ON BRUSSELS CONFERENCE ON SATELLITE TRANSMISSIONS
Washington GPO 1974 19 p Hearing before the Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 35, 20 Jun. 1974
(GPO-37-133) Avail: Comm. on Sci. and Astronaut.

The hearings are presented concerning the conference held to formulate an international agreement for the protection of the rights of broadcasters, performers, and copyright owners in television transmissions via satellite. E.J.O.

N74-30388# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, SPACE, SCIENCE, VETERANS, AND CERTAIN OTHER INDEPENDENT AGENCIES APPROPRIATION BILL, 1975
Boland Washington GPO 1974 44 p Rept. to accompany H.R. 15572 presented by the Comm. on Appropriations at the 93d Congr., 2d sess., 21 Jun. 1974
(H-Rept-93-1139; GPO-99-006) Avail: US Capitol, Senate Document Room

The committee report to the house is presented. The appropriations for 1974, and the budget estimates for 1975 are discussed for housing, disaster relief, mortages, NASA, and Veterans Administration. F.O.S.

N74-30389# Princeton Univ., N.J. Center for Environmental Studies.
ENERGY CONSERVATION IN HOUSING Progress Report, 1 Jul. 1972 - 30 Jun. 1973
John Fox, Harrison Fraker, Jr., Richard Grot, David Harrje, Elizabeth Schorske, and Robert Socolow Dec. 1973 60 p refs
(Grant NSF GI-34994)
(Rept-6) Avail: NTIS HC $6.00

A research project was conducted to determine the normal

use of energy in private homes. The data describing the consumption of energy have generally been derived from the detailed study of the performance of a dwelling in hypothetical or controlled situations are based on the requirements of some average household living in some standard unit. The activities described in the report are: (1) a statistical analysis of monthly gas consumption in four hundred town houses where gas is used exclusively for heating, (2) a program to develop instrumentation to determine the factors which determine energy utilization in a residence, (3) a close and systematic surveillance of the construction of townhouses and apartments, and (4) a program of interviews with more than thirty individuals who played a role in determining the construction of the townhouses. Suggestions for more efficient energy utilization are proposed. Author

N74-30390*# National Aeronautics and Space Administration, Washington, D.C.
SAFETY AND MAINTENANCE ENGINEERING: A COMPILATION
[1974] 28 p
(NASA-SP-5928(02)) Avail: NTIS HC $1.00 CSCL 13L

A compilation is presented for the dissemination of information on technological developments which have potential utility outside the aerospace and nuclear communities. Safety of personnel engaged in the handling of hazardous materials and equipment, protection of equipment from fire, high wind, or careless handling by personnel, and techniques for the maintenance of operating equipment are reported. M.C.F.

N74-30391# Committee on Science and Astronautics (U. S. House).
REVIEW OF TRACKING AND DATA ACQUISITION PROGRAM
Washington GPO 1974 911 p Hearings before Comm. on Sci. and Astronaut., 93d Congr., 1st and 2d Sess., No. 31, 24 Oct. 1973; 29 Jan. 1974
(GPO-33-138) Avail: Subcomm. on Aeron. and Space Technol.

A Congressional hearing was held to discuss future plans and station requirements of the Tracking and Data Acquisition (T and DA) Program in view of the changing nature of the workload expected for T and DA networks in the next five years. Data flow operational management, and program support activities are outlined, and details of the capabilities and advanced data techniques of the Spaceflight Tracking and Data Network and the Deep Space Network are given. The Tracking and Data Relay Satellite System is discussed in terms of its concept of operation, coverage capabilities, and economic benefits which justify its continuing support. Major contracts related to T and DA support are described. Station closures are discussed, and major trends are identified which are expected to influence the status of the remaining operational stations. Conclusions and recommendations are presented which indicate that both the present level of support and the long range plans for T and DA will meet the needs of the space program, and that the present level of research in laser tracking and communications should continue. A.A.D.

N74-30392*# Boston Coll., Chestnut Hill, Mass. Management Inst.
DETERMINANTS OF PROJECT SUCCESS
David Charles Murphy, Bruce N. Baker, and Dalmar Fisher 1974 178 p refs
(Grant NGR-22-003-028)
(NASA-CR-139407) Avail: NTIS HC $12.00 CSCL 05A

The interactions of numerous project characteristics, with particular reference to project performance, were studied. Determinants of success are identified along with the accompanying implications for client organization, parent organization, project organization, and future research. Variables are selected which are found to have the greatest impact on project outcome, and the methodology and analytic techniques to be employed in identification of those variables are discussed. A.A.D.

N74-30393# Oak Ridge National Lab., Tenn.
INVENTORY OF CURRENT ENERGY RESEARCH AND DEVELOPMENT
G. M. Caton, J. M. Chilton, J. K. Huffstetler, B. W. Kline, D. C. Michelson, M. P. Guthrie, and G. U. Ulrikson Dec. 1973 632 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-73-63-Vol-1) Avail: NTIS HC $33.75

An overview is presented of the research and development being done on most aspects of energy sources, electric power, energy uses and health and ecological effects. The inventory consists of data on: (1) 4907 research projects related to energy problems; (2) indices that include information on research facilities, sponsoring agencies, principal investigators, locations where research performed, and permuted title index of research projects; and (3) funding summary tables. A description of the questionnaire package sent to research investigators and organizations is given. Projects on energy sources and projects on electric power are described. NSA

N74-30394# Oak Ridge National Lab., Tenn.
INVENTORY OF CURRENT ENERGY RESEARCH AND DEVELOPMENT
G. M. Caton, J. M. Chilton, J. K. Huffstetler, B. W. Kline, D. C. Michelson, M. P. Guthrie, and G. U. Ulrikson Dec. 1973 574 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-73-63-Vol-2) Avail: NTIS HC $30.75

Projects on electric power, projects on energy uses and energy (general), and projects on health and ecological effects are described. For Vol. 1, see N74-30393. Author (NSA)

N74-30395# Oak Ridge National Lab., Tenn.
INVENTORY OF CURRENT ENERGY RESEARCH AND DEVELOPMENT. 3. INDICES
G. M. Caton, J. M. Chilton, J. K. Huffstetler, B. W. Kline, D. C. Michelson, M. P. Guthrie, and G. U. Ulrikson Dec. 1973 405 p
(Contract W-7405-eng-26)
(ORNL-EIS-73-63-Vol-3) Avail: NTIS HC $22.25

This volume, Vol. 3 contains the indices to Vols. 1 and 2, namely: Research Facility Index; Sponsor Index; Investigator Index; Location Index; and Permuted Title Index. NSA

N74-30396# Oak Ridge National Lab., Tenn.
NSF-RANN ENERGY ABSTRACTS. A MONTHLY ABSTRACT JOURNAL OF ENERGY RESEARCH
M. P. Guthrie, ed. Dec. 1973 96 p refs
(Contract W-7405-eng-26)
(ORNL-EIS-73-52-Vol-1-12) Avail: NTIS HC $7.00

The bibliography covers research on energy sources, electric power (generation, supply and demand, transmission, environmental effects, and use), and energy (production, consumption, supply and demand, and policy). The 56 research publications cited are technical journal articles, popular or semi-technical magazine articles, topical reports, progress reports, symposium papers and proceedings, monographs, and books published within the past two years. NSA

N74-30397# Atomic Energy of Canada Ltd., Chalk River (Ontario).
CHEMISTRY AND MATERIALS DIVISION Progress Report, 1 Jul. - 30 Sep. 1973
Nov. 1973 113 p refs
(AECL-4671; PR-CMA-26) Avail: AEC Depository Libraries HC $7.75; Atomic Energy of Can., Ltd., Chalk River $2.00

Progress by the following organizations is reported: solid state science branch, general chemistry branch, physical chemistry branch, materials science branch, McMaster Univ., B. C. Univ., Ottawa Univ., Western Ontario Univ., and Guelph Univ. Separate abstracts were reported for the branches. Significant results reported by the universities include: creep of Zr; thermal desorption of H2 from Pt; current-potential relations of Pt electrodes and additive effects (cyanoguanidine, urea); H/D separation factor at Pt in aqueous urea; oxidation-resistant coatings for Zr alloys; positron studies of recovery of Ni and other metals; and positron lifetime spectra of Co. Author (NSA)

N74-30398# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MULTI-PROJECT SCHEDULING PROGRAM FOR THE 4950TH TEST WING M.S. Thesis
David R. Shearin and Ronald E. Smith Feb. 1974 128 p refs
(AD-778874; GSA/SM/74-11) Avail: NTIS CSCL 15/5

The study is an attempt to develop a multi-project computer scheduling program for the 4950th Test Wing at Wright-Patterson AFB, Ohio. An investigation of the test wing was made to gather information needed to model the flight testing operation. The model uses preliminary planning estimates of manpower and time along with priority rankings as inputs to the computer program. The wing is modeled as a complex system of single line multiple server queues, and the computer is programmed in the GPSS language. The standard GPSS computer output can be used to determine probable project completion dates, resource utilization and efficient allocation, and the effects of various priority decisions. (Modified author abstract) GRA

N74-30399# Air Force Academy, Colo.
AN IMPLICIT SIDE-FIRING GUNSHIP FIRE CONTROL SYSTEM Final Report
Tom J. Forster Feb. 1974 37 p refs
(AD-777916; USAFA-TR-74-5) Avail: NTIS CSCL 19/5

The problem of operating a side-firing gunship in a closed orbit about a target in the presence of wind is investigated. The orbit is determined to be elliptical with the target at one of the foci. Orbit stability is defined and two families of stable orbits for various ratios of wind speed to airspeed are calculated from the criterion for stability. The ballistic equations for side-firing guns (drag-dominated trajectory with gravitational perturbation) are solved analytically to determine ballistic drop. Ballistic-orbit matching is accomplished to determine the criterion for matching muzzle velocity and projectile ballistic coefficient to a stable orbit specified in terms of absolute altitude and aircraft airspeed. Author (GRA)

N74-30400# Hughes Aircraft Co., Culver City, Calif.
INSTRUCTIONAL MEDIA AND CARREL SYSTEMS Final Report
Dennis J. Sullivan and Edgar A. Smith Feb. 1974 213 p refs
(Contract F33615-71-C-1860; AF Proj. 1193)
(AD-778068; AFHRL-TR-72-48) Avail: NTIS CSCL 05/9

Implementation of a major computer-managed individualized instructional system (Advanced Instructional System) requires considerable attention to both instructional environments and the media hardware and software employed. This report examines the instructional milieu with respect to performance analyses, learning carrel requirements and the equipment and techniques required to develop and maintain the software (audio-visual materials) for a large scale individualized instructional program. Author (GRA)

N74-30401# Department of Transportation, Washington, D.C. Office of Policy Review.
AIRPORT AND AIRWAY COST ALLOCATION STUDY. TECHNICAL SUPPLEMENT TO PART 1 REPORT: DEVELOPMENT OF COST BASE AND APPLICATION OF COST ALLOCATION PROCEDURES
5 Nov. 1973 192 p
(PB-229404/9) Avail: NTIS HC $16.50 CSCL 01B

This report brings together the essential issues and findings from the study, to provide information on the material presented in the Airport and Airway Cost Allocation Study Part 1 Report: Determination, Allocation and Recovery of Systems Costs. It focuses on the costs of the Airport and Airway System, how the cost base was derived, and reviews the ten cost allocation methods investigated in the course of the study. General setting of cost allocation; benefits/value of service allocation; units of cost allocation; measures of use cost allocations; long-run marginal cost allocation; long-run incremental cost allocation; separate facilities cost allocation; separable cost remaining benefits allocation; cost responsibility allocation; peak/off-peak costs. GRA

N74-30402# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
TESTIMONY BEFORE THE SUBCOMMITTEE ON ENERGY OF THE COMMITTEE ON SCIENCE AND ASTRONAUTICS, HOUSE OF REPRESENTATIVES
David C. White 23 Jul. 1973 8 p
(Grant NSF GI-32874)
(PB-227885/1; NSF-RA/N-73-048) Avail: NTIS HC $4.00 CSCL 10A

Recommendations were made that House Bills H.R. 8348 and H.R. 9133 be modified and amplified to include the following general operational features (1) specific ties to mission-oriented agencies such as the proposed ERDA with line item funding for long term core programs of research and special funding for facility development; (2) special authority to involve industry in R and D programs through both joint funding and cooperative programs to assure rapid reduction of research to practice and effective transfer to the industrial sector; (3) the establishment of a limited number of major research laboratories to supplement the National Laboratories with a clear mission for each; and (4) high level government and industry overview committees that will maintain funding and enhance a strong independent management of the research facility. GRA

N74-30403# Naval Research Lab., Washington, D.C.
REPORT OF NRL PROGRESS
Oct. 1973 86 p
(PB-230411/1) Avail: NTIS HC $3.75 Also available from NTIS on subscription $22.50/year domestic, $28.25 year foreign CSCL 05B

Ocean technology at NRL programs to solve Navy problems is examined. Hydromechanics research at the Naval Research Laboratory is reported. Progress notes are presented in the following areas: acoustics, communications sciences, metallurgy nuclear sciences, ocean technology, optical physics, radar, and solid state physics. GRA

N74-30404# Department of Transportation, Washington, D.C.
AIRPORT AND AIRWAY COST ALLOCATION STUDY. DETERMINATION, ALLOCATION AND RECOVERY OF SYSTEM COSTS. PART 1. REPORT TO THE CONGRESS
Sep. 1973 60 p refs
(PB-229826/3) Avail: NTIS HC $3.75 CSCL 01E

The Airport and Airway Development and Revenue Act of 1970 directed the Secretary of Transportation: (1) to determine the costs of the Federal Airport and Airway System; (2) to determine how these costs should be allocated among the various users; and (3) to recommend equitable ways of recovering these costs. The requested information is provided. GRA

N74-30405# General Electric Co., Santa Barbara, Calif. DASIAC
REACTION RATE DATA NO. 45
Feb. 1974 32 p
(Contract DNA001-74-C-0014)
(AD-779637) Avail: NTIS CSCL 07/4

The report contains summaries of ongoing scientific research centering around the area of atmospheric reaction kinetics. Spectra, transitions, thermochemistry, energy transfer, reactions and nuclear fireball effects are some topics included. GRA

N74-30406# Informatics, Inc., Rockville, Md.
SELECTED MATERIAL FROM SOVIET TECHNICAL LITERATURE, DECEMBER 1973
Stuart G. Hibben 28 Feb. 1974 178 p refs
(Contract F44620-72-C-0053; ARPA Order 1622-4)
(AD-779755; AFOSR-74-0784TR) Avail: NTIS CSCL 05/2

The report includes abstracts and bibliographic lists on contractual subjects which were completed in December, 1973. The major topics are: laser technology, effects of strong explosions, geosciences, particle beams, and material sciences. Sections on energy conversion and items of miscellaneous interest are included as optional topics. Author (GRA)

N74-30407# Army War Coll., Carlisle Barracks, Pa.
THE ENERGY CRISIS: REVISION IN US POLICY TO PRESERVE NATIONAL SECURITY Student Essay
John W. Duffett 22 Oct. 1973 32 p refs
(AD-778886) Avail: NTIS CSCL 05/4

World energy resources are reviewed with emphasis on the energy crisis in the U.S. Domestic and international constraints on the resolution of the energy crisis are analyzed. A revision of the priorities in national security and foreign policy are discussed in terms of our energy requirements between now and 1985. Coal, oil, gas, hydroelectric, nuclear, oil shale, wind, tide, and geothermal are appraised as sources of energy. The conclusion

of the essay is that U.S. domestic and foreign policy must be re-evaluated because of the increasing demand for energy. (Modified author abstract) GRA

N74-30408# Army War Coll., Carlisle Barracks, Pa.
DETERRENCE IN SPACE: WHO NEEDS IT
Roger D. Powell 15 Oct. 1973 25 p refs
(AD-779583) Avail: NTIS CSCL 15/3

The issue discussed is whether the U.S. should increase its research and development of defenses against earth orbiting vehicles during the next ten years. The following pertinent areas are explored: parameters of military power in space, known potential threats, feasible defenses, limitations on defenses, and application of defenses against threats. The relatively advanced state of Soviet near space technology and the long standing Soviet interest in the military implications of space indicate that a space-borne threat to the U.S. exists and is likely to expand during the next decade. The strategic implications of failing to defend against a space-borne threat are discussed. (Modified author abstract) GRA

N74-30409# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SAN FRANCISCO VESSEL TRAFFIC SYSTEM OPERATIONS AND MAINTENANCE MANUAL. VOLUME 1: FUNCTIONAL SYSTEM DESCRIPTION Semiannual Report, Jul. - Dec. 1973
Dec. 1973 229 p
(Contract DOT-CG-03301-B)
(AD-779488; APL-MSC-73-291; USCG-D-37-74) Avail: NTIS CSCL 17/7

The San Francisco Experimental Vessel Traffic System is all-weather radar/communications/computer complex intended to advise vessels of traffic conditions within that area's deep-draft waterway system. It consists of two surveillance radars; their associated adaptive video processing equipment and automatic detection and tracking computers; traffic analysis and display generation computers; operations consoles; a microwave radar relay link; ship-to-shore communications equipment; audio/video recording equipment; and operations personnel. The operational capabilities in both manual and automatic modes are described along with a functional description of the hardware and software. Author (GRA)

N74-30410# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SOME ADVANTAGES OF DISPLAY AUTOMATION IN VESSEL TRAFFIC SYSTEMS Technical Report, Jul. - Nov. 1973
J. L. MacArthur Dec. 1973 27 p refs
(Contract DOT-CG-03301-B)
(AD-779554; APL-MSC-73-352; USCG-D-68-74) Avail: NTIS CSCL 17/7

A comparison is made between the display types used in the manual VTS system (plan position radar indicators) and the automatic system (interactive graphics displays). Factors affecting operator efficiency in performing the following tasks based on radar-derived data are treated: detection, identification and tracking, and traffic analysis or interpretation. The background analysis in the automatic system, which provided operator alerts such as lane stray or collision warning, is also considered. It is concluded that in vessel traffic systems that use radar for anything beyond an occasional monitor of traffic conditions the automatic system and displays have important advantages. Author (GRA)

N74-30411# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
AUTOMATIC DETECTION AND TRACKING FOR THE SAN FRANCISCO VESSEL TRAFFIC SYSTEM Technical Report, Mar. 1971 - Jul. 1973
J. L. MacArthur, J. M. Davis, and S. F. Oden Nov. 1973 58 p refs
(Contract DOT-CG-03301-B)
(AD-779589; APL-MSC-73-351; USGC-D-67-74) Avail: NTIS CSCL 17/7

The San Francisco Vessel Traffic System (VTS) was conceived as an automated complex that would free the system operators of all routine tasks, permitting them to concentrate on situations requiring human intervention. Accordingly, a radar detection system has been designed to automatically acquire and track all vessels within a defined surveillance region covering the San Francisco Bay and seaward approach to the Golden Gate. The report describes the two major elements comprising the automatic detection and tracking system: a Radar Video Preprocessor (RVP) and a radar computer. (Modified author abstract) GRA

N74-30412# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
[PROGRESS IN GENERAL PHYSICS, PLASMA DYNAMICS, AND COMMUNICATION] Quarterly Progress Report, period ending 28 Feb. 1974
H. J. Zimmermann and J. G. King 15 Apr. 1974 186 p refs
(Contract DAAB07-71-C-0300)
(AD-778806; QPR-113) Avail: NTIS CSCL 05/2

Contents: Molecule microscopy, physical electronics and surface physics, atomic resonance and scattering, quantum electronics, microwave and millimeter wave techniques, radio astronomy, transport phenomena in solids, physical acoustics, plasma dynamics, processing and transmission of information, digital signal processing, linguistics, cognitive information processing, and communications biophysics. GRA